INSTALLATION RESTORATION PROGRAM STAGE 2-1 REMEDIAL INVESTIGATION VOLUME 1: TEXT AND PLATES

BEALE AIR FORCE BASE
MARYSVILLE, CALIFORNIA 95903-5000

CHMHILL 3840 ROSIN COURT, SUITE 110 SACRAMENTO, CALIFORNIA 95834 JANUARY 1991



Prepared for

HEADQUARTERS STRATEGIC AIR COMMAND (HQ SAC/DEVC)
OFFUTT AIR FORCE BASE, NEBRASKA 68113-5001

UNITED STATES AIR FORCE HUMAN SYSTEMS DIVISION (AFSC) IRP PROGRAM OFFICE (HSD/YAQI) BROOKS AIR FORCE BASE, TEXAS 78235-5000

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HEADQUARTERS STRATEGIC AIR COMMAND (HQ SAC/DEVC)
OFFUTT AIR FORCE BASE, NEBRASKA 68113-5001

March 1991

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This report was prepared under the supervision of Robert E. Pexton, California Registered Geologist CRG #4457.

Robert & Pexton Signed

March 29, 1991

Dated

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ES. EXECUTIVE SUMMARY

ES.1 SUMMARY OF IRP PROGRAM AT BEALE AIR FORCE BASE

Beale Air Force Base is located at the boundary of the Sacramento Valley and foothills of the Sierra Nevada, approximately 10 miles east of Marysville, California and 40 miles north of Sacramento, California. Figure ES-1 shows the location of Beale AFB.

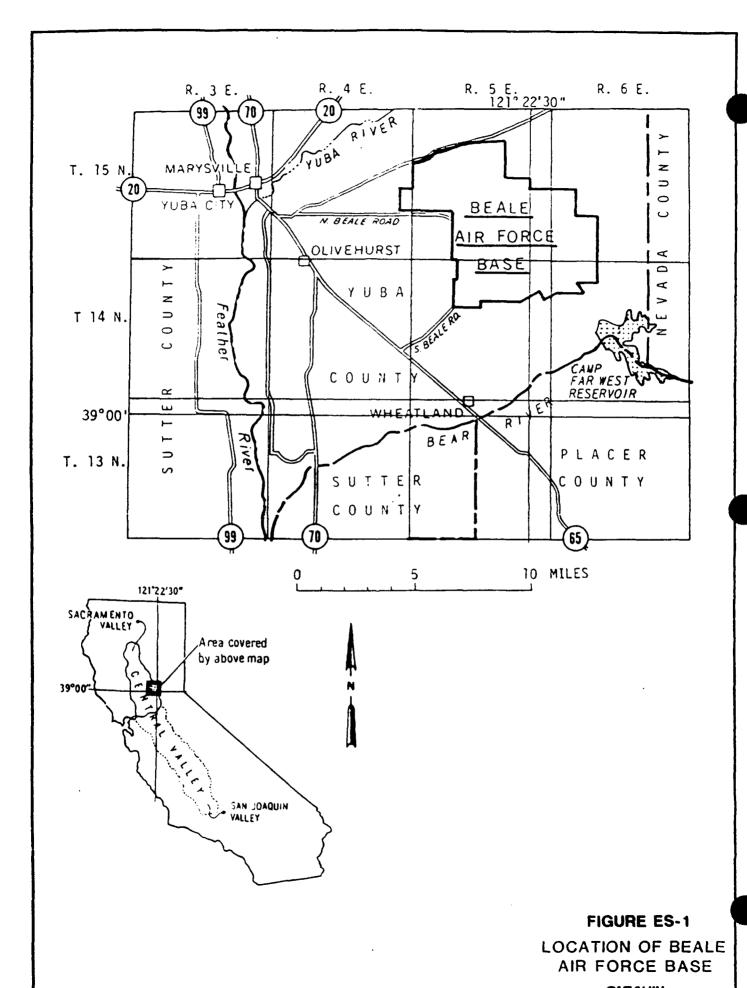
In 1984, the Installation Restoration Program, Phase I: Records Search was conducted to evaluate potential environmental concerns at the base. This study identified 16 sites of concern, two of which were later combined for a net of 15 sites. In 1985, three additional sites were added to the IRP list and the Phase II, Stage 1: Confirmation/ Quantification Study was initiated to determine if contaminants were actually present at the IRP facilities. The final report for Phase II, Stage 1 was released in May 1987.

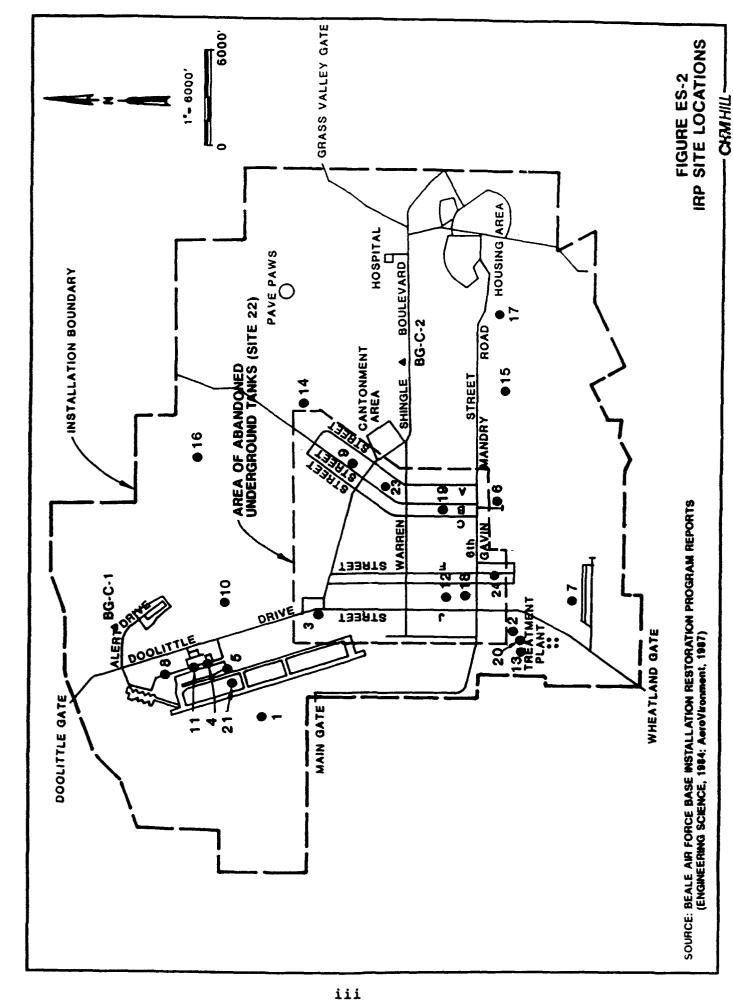
Preparation of Remedial Investigation (RI) Workplans for Stage 2-1 activities was initiated in October 1987 and four new IRP sites were added to the list, bringing the total number of sites to 22. Just prior to the start of Stage 2-1 RI activities, two additional sites were added, bringing the IRP site list to the current total of 24 sites.

Activities completed under Stage 2-1: Remedial Investigation, which are the subject of this report, include surface soil and waste sampling and analysis, subsurface soil sampling and analysis, installation of groundwater monitoring wells, sampling and analysis of groundwater and surface water on a quarterly basis for a period of 1 year, geophysical investigations at four sites, and a soil gas/ambient air study at one site. All soil and waste sampling and installation of all but one of the monitoring wells was completed between October 1988 and April 1989. One monitoring well was installed in August 1989 and the final quarterly water sampling was completed in December 1989.

ES.2 DESCRIPTION OF BEALE AFB IRP SITES

There are currently 24 IRP sites at Beale AFB. Figure ES-2 shows the location of the sites. The sites include four landfills, three fuel spill areas, two above ground fuel storage areas, two sites associated with photographic





wastewater treatment, two engine test cells, two pesticide/herbicide buildings, one fire training area, and eight other sites of various types. One of these miscellaneous sites is actually a wide area of the base where over 750 abandoned underground storage tanks are suspected. Table ES-1 lists the 24 IRP sites, a brief description of each site, and the waste types suspected for each site.

ES.3 INVESTIGATIVE PROCEDURES

Remedial investigation activities in Stage 2-1 included collecting surface soil and waste samples using hand-augering techniques. In some cases, two samples were collected from hand-augered holes to evaluate near surface vertical migration. A total of 84 hand augered holes were dug to sample surface soils and wastes.

Deeper soil investigations were conducted using hollow-stem auger drilling techniques and split-barrel samplers with brass sleeves. At several sites, the holes were drilled at 30 degrees from vertical to sample soils beneath waste areas without disturbing the wastes and creating potential migration pathways. A total of 52 soil borings were drilled, ranging from 10 to 60 feet in depth.

During prior studies at Beale AFB, 24 groundwater monitoring wells were installed. An additional 26 monitoring wells were installed as part of Stage 2-1 activities. Well drilling was accomplished using a reverse air circulation, dualtube percussion hammer method. Wells were constructed of a 20-foot-long, stainless steel, wire-wrap screen with a 5-foot stainless steel pipe section below the screen to serve as a sediment trap. The well casing was Schedule 40 PVC. Each well head was either constructed with a protective steel casing and concrete pad or was completed flush with the ground surface using a concrete vault. All wells were completed with 4-inch-diameter casings and screens, with the exception of one test well at Site 19. This Site 19 well, 19-C-4, was completed with 6-inch-diameter casings and screens and was used for a 72-hour nump test.

Table ES-2 presents the number of wells, borings, and handaugers completed at each of the IRP sites during Stage 2-1. The table does not include five vapor wells installed at Site i5 to assess landfill gas characteristics and migration.

Table ES-1 BEALE AFB IRP SITES SUMMARY

	Site	Description	Potential Waste Types
1.	West Drainage Ditch	Receives surface runoff from flight line and runway area.	Jet fuel Oil Solvents
2.	Photo Wastewater Treatment Plant (PWTP), Injection Wells, and Sludge Basins	Physical and chemical treatment of photo processing wastewater. Between 1966 and 1986, PWTP effluent was discharged into three injection wells. Since 1974 two unlined sludge ponds have been used for drying PWTP clarifier sludge. The PWTP is no longer used and is being decommissioned.	Pentachlorophenol Photo processing chemicals Trace metals Phenolics Benzene Oil and grease Chromium
3.	Fire Protection Training Areas	Fire prevention training exercises have been conducted in two areas approximately 200 feet apart. Waste oils, spent solvents, and aviation fuels were applied to the ground and ignited. There are two 25,000-gallon underground storage tanks in the area.	Waste oils Solvents Jet fuel
4.	Battery Shop Dry Well	Twenty-four gallons per month of neutralized lead-acid battery wastes were discharged to this dry well adjacent to the battery shop.	Neutralized battery acid (lead and inorganic compounds)
5.	SR-71 Shelter Drainage	Approximately 300 gallons per week of JP-7 jet fuel leaked onto hangar floors and shelter apron area. JP-7 jet fuel drained partly to an oil water separator and partly to the soil and gravel area between SR-71 shelter and flightline.	Jet fuel Solvents
6.	Landfill No. 2	The landfill occupies 56 acres and was used for refuse disposal between early 1950s and 1980. In addition, approximately 380 cubic yards of sludge from PWTP (Site 2) and small amounts of petroleum and chemicals were also disposed here. Currently used for construction and grounds maintenance debris.	Domestic and base refuse PWTP sludge Chemicals
7.	Army Biological Production Area	Area used for biological test site of wheat stem rust. Stock was incinerated and plowed into soil.	<pre>Freon, ethylene oxide, metals(?), TCE(?)</pre>
8.	J-57 Test Cell	Jet aircraft engines were tested here. Soils were stained in drainage ditch.	Jet fuel Petroleum distillates Soaps
9.	Entomology Building 2560	Gravel basin received drainage from pesticides and herbicides stored and mixed. Pesticide containers were also rinsed here.	Pesticides Herbicides
10.	J-58 Test Cell	SR-71 aircraft engines were tested here. Soils are stained in drainage ditch.	Jet fuel Petroleum distillates Soaps Oil Trichloroethylene (TCE)
11.	Aircraft Ground Equipment Maintenance Area	Aircraft ground support vehicles are known to leak oil and hydraulic fluids. Soils are stained in the ditch receiving drainage from support vehicles parking lot.	Oil Hydraulic Fluid Fuel (gasoline)

Table ES-1 (Continued)

	Site	Description	Potential Waste Types
12.	Entomology Building 440	Pesticides and herbicides were stored and mixed in and around the building.	Pesticides, herbicides
13.	Landfill No. 1	This landfill occupies 4 acres and received refuse in the 1940s. The source and composition of wastes is unknown. The site is no longer in use.	Unknown
14.	Transformer Drainage Pit	Between 1977 and 1979 transformers were drained here before repair.	Transformer oil PCBs
15.	Landfill No. 3	This landfill occupies a 40-acre site. It has been in operation since 1981 and accepts domestic garbage and refuse.	Domestic garbage and refuse
	Explosive Ordnance Disposal Area	Unused ordnances are detonated in two bunkers or in an open field in this area. Diesel fuel and wood are used to burn smaller ordnances. The burned metal portion of the ordnances are placed in a trench.	Detonated munitions, ex- plosives, flares, and pyrotechnics debris
17.	Best Slough	Empty drums were found in area.	Unknown.
18.	Bulk Fuel Storage Facility	Diked above ground fuel storage tanks.	Jet fuel Diesel fuel Motor gasoline Unleaded gasoline No. 2 fuel oil
	Photo Waste Emergency Holding Basin	During overflow conditions photo wastes were diverted to this holding basin with compacted clay bottom and cement sides. Basin is no longer in use.	PCP treated photo wastewater
	Grease Pit (Sanitary Treatment Plant)	Unlined pit used to dispose sewage plant clarifier skimmings.	Oil and grease Organic solvents
	JP-7 Above Ground Fuel Storage Tanks (Flightline)	Diked above ground fuel storage tanks.	Jet fuel
	Abandoned Underground Storage Tanks	Old base area maps show 753 abandoned underground storage tanks in the area previously occupied by Camp Beale.	Fuel oil Gasoline
23.	Ninth Transportation Shop	Repair shop and parking area for refueling trucks.	Jet fuel Diesel Oils
4.	Landfill No. 4	Trench fill 1960s-1970s. Contents unknown.	Demolition debris Domestic refuse

Table ES-2
SUMMARY OF STAGE 2-1 DRILLING AND AUGERING BY SITE

	SITE	Number of <u>Wells</u>	Number of Soil Borings	Number of Hand Augers
1.	West Drainage Ditch	5	0	12
2.	Photo Wastewater Treatment Plant, Injection Well, and Sludge Basins	1	7	14
3.	Fire Protection Training Areas	1	10	3
4.	Battery Shop Dry Well	0	1	0
5.	SR-71 Shelters Drainage Area	1	4	5
6.	Landfill No. 2	1	5	0
7.	Army Biological Production Area	0	0	0
8.	J-57 Test Cell	0	0	0
9.	Entomology Building 2560	0	1	0
10.	J-58 Test Cell	0	0	0
11.	Aircraft Ground Equipment Maintenance Area	0	3	0
12.	Entomology Building 440	0	0	0
13.	Landfill No. 1	6	5	0
14.	Transformer Drainage Pit	0	0	0
15.	Landfill No. 3	O	5	0
16.	Explosive Ordnance Disposal (EOD) Area	1	0	3
17.	Best Slough	0	0	0
18.	Bulk Fuel Storage Facility	2	3	36
19.	Photo Waste Emergency Holding Basin .	4	3	3
20.	Grease Pit (Sanitary Treatment Plant)	0	1	3
21.	JP-7 Aboveground Fuel Storage Tanks (Flightline)	1	0	5
22.	Abandoned Underground Storage Tanks	0	0	0
23.	Ninth Transportation Refueling/ Maintenance Shop	1	4	0
24.	Landfill No. 4	0	0	0
25.	Background Wells	2	0	0
	TOTAL	26	52	84

BEALE/ES2.wp

Samples collected during Stage 2-1 were analyzed according to site specific needs ranging from screening analyses for specific contaminants to detailed characterization of both organic and inorganic constituents. Table ES-3 presents the number of soil and sediment samples collected and analyzed during Stage 2-1, including the tests performed on these samples. Table ES-4 presents the same information for water samples.

In addition to sampling and analysis activities, Stage 2-1 included a geophysical investigation at four of the IRP sites and records search activities to develop background information for two of the IRP sites.

Stage 2-1 did not include risk assessment or feasibility study activities.

ES.4 SIGNIFICANCE OF FINDINGS

Results of Stage 2-1 activities combined with information obtained during previous studies indicate that the IRP sites at Beale AFB have a wide range of environmental impacts and concerns. These range from potentially serious groundwater contamination with nearby potential receptors, to sites with no contaminants detected. Table ES-5 lists significant findings for each of the IRP sites. Note that this table is a summary and is not intended to include all findings and potential concerns. Those findings listed are perceived to be the most significant. However, information not summarized in Table ES-5 should not be considered unimportant.

ES.5 RECOMMENDATIONS

Table ES-6 presents a summary of recommendations for the next stage of IRP work at Beale AFB. The table lists the sites, current category of site status, and the general actions needed. Categories are defined as: Category 1-requires no further actions, Category 2-requires additional activities, Category 3-remedial action selected, site ready for mitigation.

Table ES-3 SLMMARY OF SOIL, SEDIMENT, AND AIR SAMPLE ANALYSES BY SITE FOR STAGE 2-1 REMEDIAL INVESTIGATION

PARAMETER	ANALYTICAL METHOD	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 9	Site 11	Site 13
	1206MS	1 1 1 1 1 1 7 7 7 8 9	6 5 6 7 1 1			, , , , ,		• • • • • • • •	! ! ! !	
Petroleum Hydrocarbons (Gasoline/Diesel)	CALIF	5 7	53	28	\$	\$	27	5	•	&
ICP Screen (23 metals, exclude Boron and Silica)	Su3050/Su6010	5 7	53	28	\$		27	٧.	•	\$
Mercury	S47471		23	28			27	80		72
Organochlorine Pesticides and PCBs	SW3550/SW8080							in.		
Chlorinated Phenoxy Acid Herbicides	SW8150							\$		
Volatile Organic Compounds	SW8240	72	53	58			27	ν.	•	82
Semivolatile Organic Compounds	SU3550/SU8270	%	53	28			27		•	62
Soil Moisture Content	ASTM 02216	72	53	28	50	&	27	5	•	&
Soil pM	SN9045				v					
Polychlorinated Dibenzo-pdioxina (PCDDs) and polychlorinated Dibenzofurans (PCDFs)	S#8280		-							
Explosives	USATHAMA Method 48									
Ignitability	SW1010			58						
Cyanide, Total	su9010		83							
Air Samples Analyses Calif ADDLOG	Calif ADDLO02									

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Table ES-3 (Continued)

PARAMETER	ANALYTICAL METHOD	Site 15	Site 16	Site 18	Site 19	Site 20	Site 21	Site 23
Oil & Grease	sw9071			6 6 6 7 7 7 8		80		
Petroleum Hydrocarbons (Gasoline/Diesel)	CALIF	&	м	57	23		ν	50
ICP Screen (23 metals, exclude Boron and Silica)	SW3050/SW6010	&	M	57	21	60		50
Mercury	1.27LMS	59	м		21	60		
Organochlorine Pesticides and PCBs	SH3550/SW8080							
Chlorinated Phenoxy Acid Herbicides	S#6150							
Volatile Organic Compounds	SW8240	53	ĸ	45	12	æ		02
Semivolatile Organic Compounds	SW3550/SW8270	&	м		21	ఱ		
Soil Moisture Content	ASTM D2216	&	m	57	21	∞	S.	20
Soil per	SN9045							
Polychlorinated Dibenzo-pdioxins (PCDDs) and polychlorinated Dibenzofurana (PCDFs)	SW8280				-			
Explosives	USATHANA Method 48		m					
ignitability	SW1010					80		
Cyanide, Total	SW9010							
Air Samples Analyses	Calif ADDL002	7	,				1 3 6 6 7 7 8	1

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ES-4 SLMMARY OF GROUMDWATER AND SURFACE WATER (GW/SW) ANALYSES BY SITE FOR STAGE 2-1 REMEDIAL INVESTIGATION

PARAMETER	ANALYTICAL METHOD	Site 1 GW/SW	Site 2 GU/SU	Site 3 GU/SW	Site 4 GU/SU	Site 5 GW/SW	Site 6 GW/SW	Site 11 GW/SW	Site 13 GW/SW
Alkalinity-Carbonate, Bicarbonate & Mydroxide (Field Test)	A403	24/20	54/0	12/0	2/0	7/7	12/4	2/0	30/4
Specific Conductance (Field Test)	£120.1	24/20	24/0	12/0	5/0	7/7	12/4	2/0	30/4
pH (Field Test)	£150.1	24/20	54/0	12/0	5/0	7/7	12/4	2/0	30/4
Total Dissolved Solids	E160.1	24/20	54/0	12/0	5/0	7/7	12/4	2/0	30/4
Temperature (Field Test)	E170.1	24/20	54/0	12/0	5/0	7/7	12/4	2/0	30/4
Common Anions (Chloride, Fluoride, Sulfate)	E325.3 E340.2 E375.2	24/20 24/20 24/20	24/0 24/0 24/0	12/0 12/0 12/0	2/0 2/0 2/0	7/7	12/4 12/4 12/4	2/0 2/0 2/0	30/4 30/4 30/4
Nitrogen, Nitrate-Witrite	£353.2	24/20	54/0	12/0	2/0	7/7	12/4	2/0	30/4
Petroleum Mydrocarbons (Gasoline/Diesel)	CALIF	24/20		12/0	5/0	7/7	12/4	2/0	30/4
ICP Screen (23 metals, exclude Boron and Silica)	SW3005/SW6010	24/20	54/0	12/0	5/0	7/7	12/4	2/0	30/4
Arsenic	090ZNS	24/20	54/0	12/0			12/4		30/4
P**	SW3005/SW7421	24/20	54/0	12/0	2/0		12/4	2/0	30/4
Mercury	SW7470		24/0	12/0			12/4		30/4
GW = GROUNDUATER SW = SURFACE WATER					† † 5 1 4 2 4 5	1 1 1 1 1 1 1	* * * * * * * * * * * * * * * * * * *	•	•

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 $\text{GW}\approx\text{GROUNDMATER}$ $\text{SW}\approx\text{SMRFACE}$ WATER a: Includes off-base well samples for third and fourth sampling rounds.

ES-4 Continued)

PARAMETER	AMALYTICAL METHOD	Site 15 GW/SW	Site 16 GW/SW	Site 18 GW/SW	Site 19 GW/SW	Site 21 GW/SW	Site 23 GW/SW	BACK- GROUND GW/SH
Alkalinity-Carbonate, Bicarbonate & Hydroxide (Field Test)	A403	16/0	0/4	0/7	15/4	2/0	2/0	0/2
Specific Conductance (Field Test)	£120.1	16/0	0/7	0/7	15/4	2/0	2/0	0/2
pH (Field Test)	E150.1	16/0	0/7	0/7	15/4	2/0	2/0	0/2
Total Dissolved Solids	E160.1	16/0	0/7	0/7	15/4	2/0	2/0	0/2
Temperature (Field Test)	E170.1	16/0	0/7	0/5	15/4	2/0	2/0	0/2
Common Anions (Chloride, Fluoride, Sulfate)	E325.3 E340.2 E375.2	16/0 16/0 16/0	0/4	0/7 0/7	15/4 15/4 15/4	5/0 5/0 5/0	2/0 2/0 2/0	0/2 0/2 0/2
Nitrogen, Witrate-Witrite	E353.2	16/0	0/4	0/7	15/4	2/0	2/0	0/2
Petroleum Mydrocarbons (Gasoline/Diesel)	CALIF	16/0	0/7	0/4	15/4	2/0	2/0	0/2
ICP Screen (23 metals, exclude Boron and Silica)	SW3005/SW6010	16/0	0/7	0/7	15/4	2/0	2/0	2/0
Arsenic	SW7060	16/0	0/7		15/4			0/2
Pead	SW3005/SW7421	16/0	0/7	0/7	15/4		2/0	0/2
Mercury	Su74.70	16/0	0/7		15/4			2/0
GW = GROUNDHATER SW = SURFACE WATER							1 1 1 1 1 6 6 6 6	; ; ; ; ;

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PARAMETER	ANALYTICAL METHOD	Site 15 GW/SW	Site 16 GW/SW	Site 18 GW/SW	Site 19 GW/SW	Site 21 GW/SW	Site 23 GW/SW	Back- Ground GW/SW
Selenium	07/2/ns	16/0	0/4		15/4	*		0/2
Purgeable Malocarbons	SW5030/SW8010	16/0	0/7	0/7	15/4	2/0		0/2
Purgeable Aromatics	SW5030/SW8020	16/0	0/7	0/7	15/4		2/0	0/2
Semivolatile Organic Compounds	SW3510/SW8270	16/0	0/7		15/4			0/2
Chemical Oxygen Demand (COD)	A508A	16/0			15/4			0/2
INT, RDX, Picric Acid	USGS01		0/7					
GW = GROUNDWATER				:	* * * * * * * * * * * * * * * * * * *			

GW = GROUNDWATEK SW = SURFACE WATER

TBLES4DJL.WK1

Table ES-5 SIGNIFICANT IRP STAGE 2-1 FINDINGS

	Site	Stage 2-1 Findings
1.	West Drainage Ditch	 Ditch sediments contaminated with TFH and metals Groundwater contaminated with TCE Significant potential for migration
2.	Photo Wastewater Treatment Plant	 Soil near Injection Well No. 2 contaminated with TCE Groundwater contaminated with TCE Sludge pond sediments contaminated with metals and dioxin Significant potential for migration
3.	Fire Protection Train- ing Area	 Soil contaminated with TFH, volatile organics, and lead Contamination not detected in groundwater Significant potential for migration (soil to groundwater)
4.	Battery Shop Dry Well	 Soil contaminated with metals Groundwater contamination not detected
5.	SR-71 Shelters Drain- age Area	 Ditch sediments contaminated with TFH Surface water contaminated with TFH Groundwater contaminated with TCE Significant potential for migration
6.	Landfill No. 2	 Groundwater contamination not detected Low levels of organic compounds in soil
7.	Army Biological Production Area	• No testing performed
8.	J-57 Test Cell	 No testing performed
9.	Entomology Building 2560	 Previous chlordane detection not confirmed Minimal potential for migration
10.	J-58 Test Cell	 No testing performed
11.	Aircraft Ground Equip- ment Maintenance Area	 Soil contaminated with TFH Groundwater contamination not detected Minimal potential for migration
12.	Entomology Building 440	 No testing performed

Table ES-5 (Continued)

	Site	Stage 2-1 Findings
13.	Landfill No. 1	 Soil contaminated with volatile organics Groundwater contaminated with volatile organics Probable migration of contaminants in groundwater
14.	Transformer Drainage Pit	• No testing performed
15.	Landfill No. 3	 Groundwater contamination not detected except low level TFH in fourth quarter Contamination detected in landfill gas Contamination detected in downwind air samplesource unconfirmed
16.	Explosive Ordnance Disposal Area	 Soil in trench contaminated with metals Explosive compounds and TFH-gas detected in fourth quarter
17.	Best Slough	 No buried drums detected
18.	Bulk Fuel Storage Facility	 Soil in bermed tank areas contaminated with TFH, volatile organics and metals Groundwater contamination not detected
19.	Photo Waste Emergency Holding Basin	 Soil contamination mainly confined to the EHB clay liner Groundwater contaminated with TCE and carbon tetrachloridesource unconfirmed Metals contamination of fourth round surface water - source unknown
20.	Grease Pit	 No soil contamination detected beneath Grease Pit
21.	JP-7 Above Ground Fuel Storage Tanks (Flight- line)	 Soil contaminated with TFH Groundwater contaminated with TFH Significant potential for migration
22.	Abandoned Underground Fuel Storage Tanks	 Magnetometers tentatively identified buried tanks at 55 of 80 locations
23.	Ninth Transportation Refueling/Maintenance Shop	 Soil contaminated with TFH Groundwater contaminated with TFH Significant potential for migration
24.	Landfill No. 4	 No testing performed Site visit and interviews with base personnel indicate past landfill activity

Table ES-6 RECOMENDED ACTIVITIES

	SITE	Recommendation ^a Category	Recommended Stage 2-2 Actions	Additional RI Activities
÷	West Drainage Ditch	~	R1/M/RA/FS	o Determine downstream extent of soil contamination. o Determine depth of soil contamination. o Determine down gradient groundwater contamination. o Continue groundwater monitoring.
**2.	Photo Westewater Treatment Plant, Injection Well, and Sludge Basins	~	M/RA/FS	o Continue groundwater monitoring.
ĸ	Fire Protection Training Areas	N	RI/M/RA/FS	o Determine extent of soil contamination in FPTA No. 1. o Continue groundwater monitoring.
4	Battery Shop Dry Well	~	=	o No additional RI. o Continue groundwater monitoring.
.	SR-71 Shelters Drainage Area	~	M/RA/FS	o Add wells if TCE in groundwater is confirmed. o Continue groundwater monitoring.
•	Landfill No. 2	~	M/RA	o No additional RI. o Continue groundwater monitoring.
7.	Army Biological Production Area	-	NO ACTION	o No additional RI.
•	J-57 Test Cell	8	RI/H	o Additional soil sampling. o Additional groundwater monitoring.
<u>«</u>	Entomology Building 2560	-	NO ACTION	o No additional RI.
	J-58 Test Cell	8	RI/M/RA	o Determine extent of soil contamination. o Additional groundwater monitoring.
=	Aircraft Ground Equipment Maintenance Area	8	M/RA	o No additional RI. o Continue groundwater monitoring.
12.	Entomotogy Building 440	-	NO ACTION	o No additional RI.
**13.	Landfill No. 1	~	RI/M/RA/FS	o Determine extent of groundwater contamination. o Continue groundwater monitoring. o Sample off-base domestic wells.
₹.	Transformer Drainage Pit	8	.	o Determine vertical extent of soil contemination.

Table ES-6 (Continued)

Additional RI Activities	o No additional RI. o Continue groundwater monitoring.	o Collect additional groundwater data with new wells. o Continue groundwater monitoring.	o No additional RI.	o Determine extent of soil contemination. o Continue groundwater monitoring. o Add another downgradient and upgradient well.	o No additional RI. o Continue groundwater monitoring. o Add additional downgradient wells.	o No additional RI.	o Determine extent of groundwater contamination, o Determine vertical extent of soil contamination. o Continue monitoring existing well.	o Excavate at suspected tank locations. o Sample soil beneath pulled tanks.	o Determine extent of soil contamination. o Continue groundwater monitoring.	o Determine if soil beneath trenches is contaminated. o Determine if groundwater is contaminated.
Recommended Stage 2-2 Actions	x	RI/N	NO ACTION	RI/M	z.	NO ACTION	RI/N		RI/N	i z
Recommendation*	8	8	-	N	2	-	~	۲	2	2 RI
\$11E	Landfill No. 3	Explosive Ordnance Diaposal (EOD AREA)	Best Slough	Bulk Fuel Storage Facility	Photo Waste Emergency Molding Basin	Gresse Pit (Sanitary Treatment Plant)	JP-7 Aboveground fuel Storage Tanks (Flightline)	Abandoned Underground Storage Tanks	Ninth Transportation Refueling/ Maintenance Shop	24. Landfill No. 4
	15.	.9	17.	18.	<u>6</u>	**20.	•21.	22.	13	24.

Sites 1, 5, and 21 are considered an operable unit and all actions taken on these sites should be coordinated. Sites 2, 13, and 20 are not considered an operable unit but are in geographic proximity. Some actions taken at these sites may be coordinated.

Category 1: No further action. Category 2: Additional activities needed. RI Remedial Investigation

M : Monitoring RA: Risk Assessment FS: Feasibility Study Activities may be completed as seperate RI tasks or, in some cases, as part of the FS process.

18L-ES6.RI

I. INTRODUCTION

1.1 AIR FORCE INSTALLATION RESTORATION PROGRAM

1.1.1 PROGRAM ORIGIN

1.1.1.1 History of Legislation

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the "Superfund" Act. This act sets forth responsibility for the identification and cleanup of contaminated sites within the United States and its possessions. The Superfund Act also designated the U.S. Environmental Protection Agency (EPA) as the policy and enforcement agency.

In 1980, the National Contingency Plan (NCP) was issued to provide response guidance and a process by which to report contaminant releases, identify and quantify contamination, and select appropriate remedial actions. The NCP describes the responsibility of the federal government, state governments, and parties responsible for the release.

In 1983, President Reagan signed Executive Order 12316, which delegated the role as lead agency to various federal agencies (Department of Defense [DOD], Department of Energy [DOE]) to conduct investigations and implement cleanup when they are the sole or co-contributor to contamination on or off their properties.

In October 1986, President Reagan signed into law the Superfund Amendments and Reauthorization Act (SARA) of 1986. This law extends the requirements of CERCLA but modifies CERCLA with respect to the goals of cleanup and the process leading to the selection of a remedy. Under SARA, technologies that provide permanent removal or destruction of a contaminant are preferable to action which only contains or isolates the contaminant. SARA also provides for greater interaction with the public and state agencies and extends EPA's role in evaluating the health risks associated with the contamination. Under SARA, early determination of the applicable or relevant and appropria requirements (ARARs) is required, and potential remediation alternatives should be considered at the initiation of a remedial investigation/ feasibility study (RI/FS). Figure 1-1 is a diagram of the remedy selection under SARA.

Select a cost-effective that will attain state/ 4. Select a remedy that solutions and allernaand the environment tive technologies to the maximum extent that is protective inlerim responses SELECTION OF REMEDY federal ARARs Select a remedy Select a remedy of human health pon completion uses permanent 5. Consider use of practicable remedy d environent, compliance with ARARs, DETAILED ANALYSIS OF ALTERNATIVES Verily/compare protectiveness, permanent solutions involving treatment), and other statutory short-term effectiveness, imple 1. Perform treatability tests as necessry Analyze relative costs fong and protection of public health and (attainment of preference for Develop general performance criteria to each afternative 2. Collect additional field data as necessary to refine general site characreduction of mobility/loxicity lactors, (Consider waivers as POST-SCREENING FIELD INVESTIGATION mentability necessary.) **1erization** حi က REMEDIAL INVESTIGATION FEASIBILITY STUDY INITIAL SCREENING Screen afternatives to narrow the field to be analyzed in detail 3. Assess need for treatability studies, including materials handling Define nature and extent of contamination (waste types, concentrations SITE CHARACTERIZATION lechnologies, containment/disposal requirements for residuals or untreat-Delevop a range of alternatives Assemble treatment/disposal combinations into alternatives DEVELOPMENT OF ALTERNATIVES ed waste and related ARARs Identify potential treatment altaining various levels of treatment performance distributions) 2. Define DOOs (e.g. land ban) Identify initial data quality objectives (DOOs) for reunit likely response ARARs, determine SCOPING OF THE RIVES state and federal initial action levels project/operable Identify potential health based and medial investigabcation-specific Identify initial ĕ n

FIGURE 1-1
REMEDY SELECTION PROCESS
UNDER SARA

SEAT.

In July 1987, President Reagan signed Executive Order 12580, which replaced EO 12316. This order delegated responsibility to conduct site investigations and cleanups at federal facilities to the secretaries of various agencies. This order defined relationships between various federal and state agencies. EPA was assigned the role of lead agency for oversight of all sites on the National Priority List (NPL), including federal facilities such as Air Force bases. In cases where lead-agency responsibility is assigned to state agencies, usually for non-NPL sites, EPA's role is primarily to provide review and comment for work activities and to serve as a facilitator in dispute resolutions.

In addition to federal requirements, several sites at Beale AFB were also subject to State of California requirements under the Toxic Pit Cleanup Act (TPCA) and the Calderon Bill. The California Regional Water Quality Control Board required a hydrogeologic assessment report (HAR) for the Photowastewater Emergency Holding Basin at Beale AFB (Site 19) under TPCA. The California Department of Health Services required a Solid Waste Assessment Test (SWAT) report for the landfills at Beale AFB under the Calderon Bill. Activities to meet these requirements were included in investigations at Beale AFB.

1.1.1.2 History of Installation Restoration Program (IRP)

The Air Force Installation Restoration Program (AFIRP) predated CERCLA and was initiated to identify potentially contaminated sites, investigate these sites, and evaluate and select appropriate remedial actions. AFIRP was originally organized into the following four phases (see Figure 1-2):

- o Phase I Records Searches
- o Phase II Confirmation and Quantification Studies
- o Phase III Technology Development
- o Phase IV Remedial Action Plans and Implementation

Phase I Records Searches were installation-wide studies that identified and assessed past disposal sites. File material, site visits, and interviews provided the information for these initial assessments. These assessments considered whether or not each site posed hazards to public health or to the environment. If a site presented little or no apparent hazard, it did not proceed to subsequent phases. If a site presented an imminent threat to public health, an

1-4

emergency response, which was considered a Phase IV action, was taken. If sampling and evaluation were required to confirm the suspected hazard, Phase II studies were initiated. Sites identified in Phase I were rated by the U.S. Air Force's (USAF's) Hazard Assessment Rating Methodology (HARM), a system that ranked the site for its potential hazards to people and environmental resources.

Phase II Confirmation and Quantification Studies evaluated the presence or absence of contamination, determined the extent and degree of contamination, and provided the basis for selecting the appropriate type of remedial action. During this phase, groundwater, soil, and sediment samples were usually collected and analyzed. Geologic profiles were typically defined by drilling. Remote sensing techniques were sometimes used to define the size and location of the waste disposal area.

If these studies revealed no contamination that threatened human health or the environment, then the results were documented and no further action was taken on the site. Phase II sampling at some sites did not detect enough contamination to justify costly remediation projects as determined by preliminary risk assessments and feasibility studies, but the development of future threats was still a possibility. The approach used for such sites was typically long-term monitoring, which included continued site surveillance by a program of water, soil, or sediment analysis. Sites which were shown to be a threat typically proceeded to Phase IV.

Phase III Technology Development efforts were not undertaken for each site but were intended to improve site investigation and cleanup technology through research, development, and testing. Phase III was initiated for sites that could not be controlled with proven technology or for sites that were suitable for evaluating new technologies, such as inplace degradation of organic contaminants (such as JP-4) through enhancing the growth of naturally occurring soil bacteria.

Phase IV was conducted in two stages. Phase IV-A Remedial Action Plans (RAPs) documented the development, evaluation, and selection of alternatives to control the hazards posed by a waste disposal site. Selection of the best alternative was based on engineering feasibility, cost, environmental effects, public health effects, and compliance with regulatory requirements. Phase IV-B was implementation of the selected alternative and normally included design,

construction, and modified waste management methods. Longterm monitoring was often performed in association with site cleanup to ensure compliance with contaminant standards or achievement of cleanup goals.

In November 1986, in response to SARA and in consideration of various EPA guidance, USAF modified AFIRP to provide for an integrated RI/FS program. The intent is to conduct the RI/FS in parallel instead of serial fashion. The program now more closely resembles the EPA RI/FS process and includes ARAR determinations, identification and screening of technologies, and development of alternatives. It may include multiple field activities and pilot studies prior to the detailed final analysis of alternatives. In some instances, however, primarily as a function of available funding, the RI and FS portions of the process are accomplished in separate, non-concurrent tasks.

1.1.2 PROGRAM OBJECTIVES

The objective of the current AFIRP is to develop and select appropriate and cost-effective solutions to remediate contamination resulting from USAF operations which pose an existing or potential risk to human health or the environment. This objective is met through a well-defined and technically sound approach in accordance with CERCLA, NCP, and SARA. The solutions that are developed should provide the level of protection necessary to protect public health and the environment, meet the requirements of ARARs, and be technically feasible to implement at the specific site.

For the AFIRP to meet the overall program objective, project-specific objectives must be met. These include:

- 1. Develop a defensible database through good field practice and rigorous analytical procedures.
- 2. Develop and implement a quality assurance/quality control (QA/QC) program to assure the production of meaningful and defensible data.
- 3. Develop and adhere to site and laboratory safety programs to protect the health of personnel and prevent the release of contaminants.
- 4. Establish a rigorous procedure to identify, evaluate, and select appropriate solutions.

- 5. Establish a process to identify data gaps and develop appropriate additional or supplemental studies to collect necessary data. This includes additional field and/or analytical data collection as well as the evaluation of candidate technologies.
- 6. Develop and implement the program in compliance with appropriate federal regulations and available guidance.
- 7. Provide the public and regulatory agencies with information regarding the nature of the contamination, the effects upon the community, the progress of the program, and the preferred remedial alternative and its impacts.

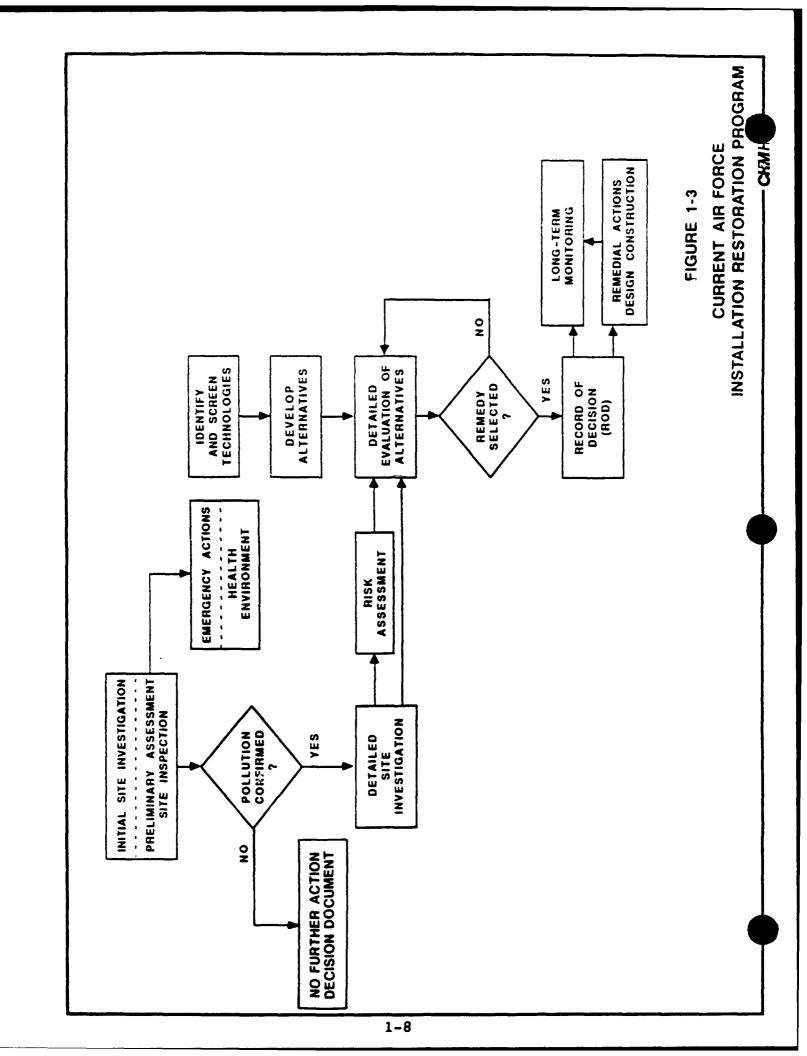
1.1.3 PROGRAM ORGANIZATION

The current AFIRP process consists of several steps, including a preliminary site assessment, followed by either an RI/FS program or a no-action recommendation, screening of remedial alternatives, selection of a preferred remedial action alternative, and the design and implementation of the selected alternative (see Figure 1-3).

In the preliminary assessment, a survey of a base (USAF installation) or site within an installation is conducted to determine if past operations or disposal practices may have resulted in a potential release of contamination. This process includes a records search to document what potential contaminants were used, stored, and disposed and where such activities were conducted. If a release is suspected, an initial sampling and analytical program is recommended to confirm the presence and identify target contaminants.

This preliminary assessment phase has been completed nation-wide, resulting in a determination of bases and sites on bases for which either an RI/FS program is recommended or a determination that there is no evidence of contamination and no further actions are required.

For those bases or sites within bases that require further action, an RI/FS program is developed. The RI/FS program involves a preliminary sampling and analysis effort leading to the development of alternatives. If necessary, a more detailed sampling and analysis effort is conducted to determine the extent of contamination and define exposure pathways to aid in the selection of alternatives. The RI/FS encompasses several key elements necessary to select an appropriate remedial action. These include:



- 1. Determination of the federal and state ARARs
- 2. Development of the data quality objectives (DQOs) consistent with the ARARs and achievable with acceptable field and analytical procedures
- 3. Performance of a field investigation of the impacted media along with collection of sufficient physical environment information to assess contamination movement and pathways and to support development of potential alternatives. The field investigation may be conducted in one or more stages depending on the results of the initial field work.
- 4. Determination of the hazards by quantifying the impact on receptors through the exposure pathways of surface water, groundwater, biota, and air. This determination meets the exposure and risk assessment requirement under CERCLA, NCP, and follows the steps in the Superfund Public Health Evaluation Manual.
- 5. Determination of those sites where the results of the field investigation and risk assessment indicate no significant threat to human health or welfare or the environment, and a preparation of a Technical Document to Support No Further Action.
- 6. Development of a set of potential alternatives consisting of appropriate technologies that can remove or eliminate the contamination or control its migration. These alternatives should provide a range of reduction of the mobility, toxicity, or volume (MTV) associated with the contamination and meet or exceed the ARARs.

Initial screening of alternatives is conducted using screening criteria of effectiveness, implementability, and cost. If necessary, field or bench scale testing is conducted to better assess alternatives. A more detailed analysis is then conducted to evaluate alternatives in terms of effectiveness, compliance with ARARs, reduction of MTV, schedule, reliability, and capital and operation and maintenance (O&M) cost.

At the completion of the RI/FS process, which is the functional equivalent of the selection of a remedy process as outlined in NCP and through EPA guidance or SARA, a preferred alternative is selected. A Record of Decision (ROD) for

the site and the alternative can be prepared using the information and recommendation contained in the Final IRP Technical Report.

The final phase of the AFIRP consists of the design and implementation of the selected remedial action alternative. It may be necessary at the design stage to obtain additional technology-related data in order to finalize the design and to specify equipment or system operating criteria. The product of the design effort is a specification package that will be used to select remediation contractors for implementation at the site.

1.1.4 PROGRAM DOCUMENTS

All IRP work conducted under the guidance of the U.S. Air Force Human Systems Division (USAF-HSD), previously Occupational and Environmental Health Laboratory (USAFOEHL), follows procedures and information provided in the applicable documents listed in Table 1-1. In addition to guidance documents, the results of work performed as part of the IRP at applicable USAF installations are recorded in detail in technical reports that delineate all findings from each investigative stage of the IRP. These reports become program documents upon acceptance by USAF and applicable agencies.

1.2 TIME PERIOD AND DURATION OF THIS AND PREVIOUS IRP PROGRAMS

Previous IRP activities at Beale AFB include the Phase I - Records Search and the Phase II, Stage 1 - Confirmation/Quantification Study. Additional environmental studies have also been conducted at some of the Beale IRP sites. This section discusses the time and duration of these previous studies and the current Stage 2-1 Remedial Investigation. A timeline, given on Figure 1-4, shows major activities in the IRP process at Beale AFB.

In January 1984, Engineering-Science, Inc. conducted field work for Phase I - Records Search. The Phase I report was issued in April 1984, and identified 16 potentially contaminated sites. The report recommended monitoring at six of the sites. Table 1-2 lists all of the IRP sites and indicates when they were added to the IRP program.

In January 1985, the Air Force combined two of the original sites, the photo wastewater treatment plant and the photo waste injection wells, into one site and added three new

Table 1-1
APPLICABLE DOCUMENTS FOR THE IRP

	Code	Document
1.1	Public Laws	
	United States Code	
	PL 96-510	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980
	PL 99-499	Superfund Amendments and Reauthorization Act (SARA) of 1986
1.2	Regulations	
	Code of Federal Regulations	
	40 CFR 136.3e, Table II	Required Containers, Preservation Techniques, and Holding Times
	40 CFR 136, Appendix A	Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
	40 CFR 136, Appendix B	Definition and Procedure for the Determination of the Method Detection Limit
	40 CFR 136, Appendix C	Inductively Coupled Plasma - Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes Method 200.7
	40 CFR 300.61- 300.71 (Subpart F)	National Contingency Plan (NCP)
	Federal Register	
	Vol. 51, No. 114, 13 June 1986	Toxicity Characteristic Leaching Procedure (TCLP)
1.3	Presidential Documents	
	Executive Orders	
	EO 12088	Federal Compliance with Pollution Control Standards (13 Oct 1978)
	EO 12580	Superfund Implementation (23 Jan 1987)

Table 1-1 (continued)

	Code	Document
1.4	Manuals	
	U.S. Environmental Protect:	ion Agency
	EPA-330/9-S1-002	NEIC Manual for Groundwater/Subsurface Investigations at Hazardous Waste Sites
		Superfund Exposure Assessment Manual (January 1986)
	EPA-540/1-86-060	Superfund Public Health Evaluation Manual (October 1986)
	EPA-600/4-79-020	Methods for Chemical Analysis of Water and Wastes (1983)
	SW-846	Test Methods for Evaluating Solid Waste, Third Edition (1986)
		ociation (PHA), American Water Works ter Pollution Control Federation (WPCF)
	l6th Edition	Standard Methods for the Examination of Water and Wastes
	American Society for Testin	ng and Materials (ASTM)
	D-1452	Soil Investigation and Sampling by Auger Boring
	D-1586	Penetration Test and Split-Barrel Sampling of Soils
	D-2487	Unified Soil Classification System (USCS)
	D-2488	Recommended Practices for Visual- Manual Description of Soils
	Annual Book of ASTM Standards	Section 11, Water and Environmental Technology

Code _____ Document

1.5 Handbooks

U.S. Environmental Protection Agency

EPA-600/4-82-029

Handbook for Sampling and Sample Preservation of Water and Wastewater (1982)

1.6 Guidance Documents

U.S. Environmental Protection Agency

EPA-540/G-85-002

Guidance on Remedial Investigations

under CERCLA

EPA-540/G-85-003

Guidance on Feasibility Studies

under CERCLA

1.7 Journals

Analytical Chemistry

Vol. 55, pp. 2210-2218, Dec. 83 Principles of Environmental Analysis

Source: USAFOEHL/TS, 1987

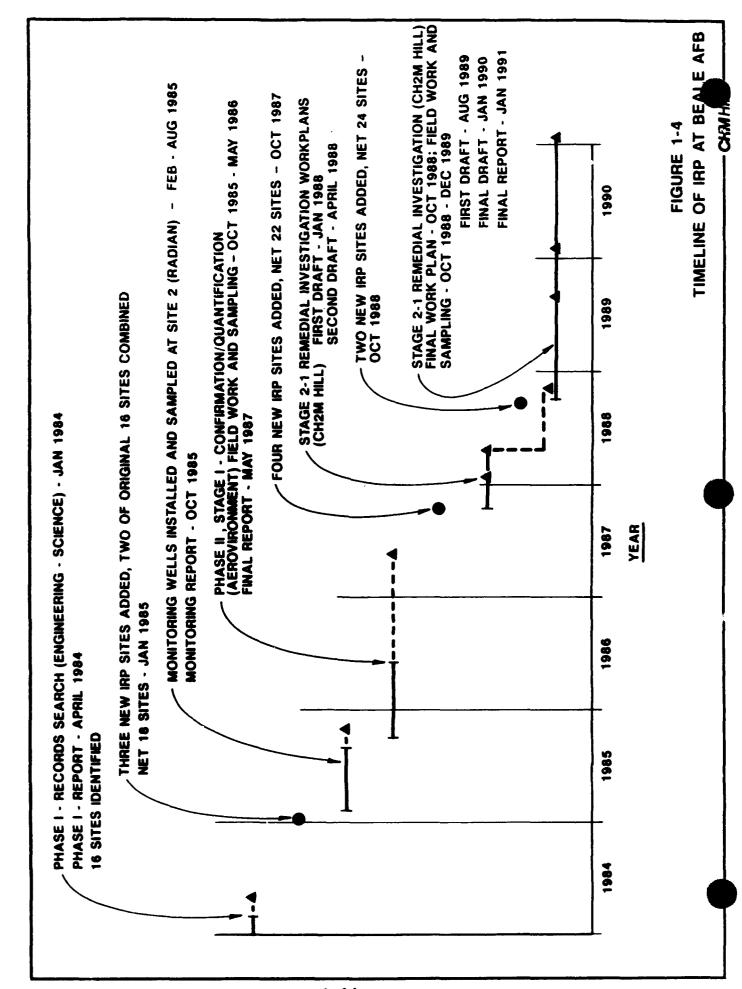


Table 1-2
IRP SITES AND DATES ADDED TO IRP PROGRAM

Site	Identified in Phase I Records Search ^a April 1984	Added Prior to Phase II, Stage I Investigation January 1985	Added Prior to Stage 2-1 Work Plans Development September 1987	Added Prior to Stage 2-1 Investigation September 1988
1. West Drainage Ditch	x			
2. Photo Wastewater Treatment Plant	x			
3. Fire Training Area	x			
4. Battery Shop Dry Well	x			
5. SR-71 Shelter Drainage	x			
6. Landfill No. 2	x			
7. Army Biological Area	x			
8. J-57 Test Cell	x			
9. Entomology Building 2560	x			
10.J-58 Test Cell	x			
<pre>11.Aircraft Ground Equipment</pre>	X			
12. Entomology Building 440	x			
13. Landfill No. 1	x			
14. Transformer Pit	x			
15. Landfill No. 3	x			
16.Explosive Ordnance Disposal Area		x		
17.Best Slough		X		
18. Bulk Fuel Storage		x		
19. Emergency Holding Basin			x	
20. Grease Pit			x	
21. JP-7 Fuel Tanks (Flightline)			x	
22. Abandoned Underground Storage Tanks			X	
23. Ninth Transportation Shop				x
24. Landfill No. 4				x
Total	15ª	18	22	24

^{*}Sixteen sites originally identified in Phase 1. Two sites, the Photo Wastewater Treatment Plant and the Photo Waste Injection Wells were combined to become Site 2, yielding a net total of 15 sites.

sites, the Explosive Ordnance Disposal Area, Best Slough, and the Bulk Fuel Storage Area to the IRP list.

During 1985, the California Department of Health Services (DHS) and the California Regional Water Quality Control Board (RWQCB) determined that all 18 identified sites should be investigated and, in September 1985, AeroVironment began the Phase II, Stage 1 Confirmation/Quantification study of the 18 sites. Field and analytical work continued through May 1986, and the final Phase II, Stage 1 report was issued in May 1987. This report recommended that no additional IRP activities be conducted at 13 of the 18 sites. For the remaining 5 sites, additional IRP actions were recommended.

In early 1987, the state agencies agreed that no action would be required at two of the 18 sites (Entomology Building 440 and the Army Biological Area), but additional investigation would be necessary at the remaining 16 sites. CH2M HILL was tasked by USAFOEHL, in September 1987, to prepare workplans, quality assurance project plans, and site safety plans for additional IRP activities. At the same time, four new IRP sites were added (the Photo Waste Emergency Holding Basin, Grease Pit, Flightline JP-7 above ground tanks, and the basewide abandoned underground storage tanks), bringing the total number of sites to 22. Draft workplans were completed in January 1988, and the draft final workplans were submitted to the agencies in April 1988.

After evaluation of available funding and comments by the agencies, it was determined by the Air Force that IRP activities would be initiated for 17 of the 22 sites. Two additional sites were then added (the Ninth Transportation Shop and a newly identified Landfill No. 4), bringing the IRP site total to 24, and the number of sites to be investigated to 19. Table 1-3 shows the 24 IRP sites and the current status of each site in the IRP process.

In September 1988, CH2M HILL was tasked to begin the Stage 2-1 Remedial Investigation (Delivery Order given in Appendix B). The first task, finalization of workplans, was completed in early October and field work was initiated in late October. The final sampling for this investigation was completed in December 1989, with laboratory analyses being completed in January 1990. Reports that have been or will be generated for this investigation are listed in Table 1-4 and include the RI technical report and state compliance reports required by the Toxic Pit Cleanup Act (TPCA) and Calderon Act Solid Waste Assessment Test (SWAT).

Table 1-3 CURRENT SITE STATUS IN 1RP PROCESS

		Records	Prelim- inary	Add1- tional	Risk Assess-	Prelim- inary	Detailed	Alter- native	Declaton	Reme- dial
1	Site	Seerch	RI	Z.	Dent	rs.	FS.	Selected	Document	Act ton
<u>-</u>	West Drainage Ditch	×	×	×	ххх	XXX				
.	Photo Wastewater Treatment Plant	*	×	×	ХХХ	XXX				
	Fire Training Area	×	×	X						
*	Battery Shop Dry Well	×	×	×	XXX	XXX				
۶.	SR-71 Shelter Drainage	×	×	×	XXX	XXX				
•	Landfill No. 2	×	×	X	XXX	XX				
7.	Army Biological Area	×	×	V/R	N/A	W/W	N/N	×	XX	N/A
	J-57 Test Cell	×	×							
٠ <u>.</u>	Entomology Building 2560	×	×	×	XXX	XXX				
10.	10. J-58 Test Cell	×	×							
Ξ	 Aircraft Ground Equipment Maintenance 	×	×	×	XXX	ХХХ				
12.	12. Entomology Building 440	×	×	V/N	W/W	N/A	N/A	×	X	V/N
2	Legend: X = Completed in previous studies XX = Conducted in this stage (Stage 2-1) XXX = To be completed in Stage 2-2, if necessary	is studies tage (Stage Stage 2-2,	1 2-1) 1f necessa		 Not applicable To be complet 	ble pleted in f	N/A = Not applicable (blank) = To be completed in future tasks, if necessary	if necessar	.	

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Table 1-3
CURRENT SITE STATUS IN IRP PROCESS
(Continued)

3 7 7	Records	Prelim- inary	Addi- tional	Risk Assess-	Prelim- inary	Detailed	Alter- native	Decision	Reme-
21.6	See ren	*	N N	ment	ES.	FS.	Selected	Document	Act ton
13. Landfill No. 1	×	×	×	XXX	XXX				
14. Transformer Pit	×	×							
is. Landfill No. 3	×	×	×	XXX	ххх				
ic. Explosive Ordnance Disposal	×	×	×	XXX	XXX				
17. Best Slough	×	×	ä				XX	×	N/A
18. Bulk Puel Storage	×	×	×	XXX	XXX				
19. Emergency Holding Basin	×	Ħ		XXX	XXX				
20. Gresse Pit	×	Ħ		XXX	XXX				
21. JP-7 Puel Tanks (Flightline)	*	Ħ		XXX	XXX				
22. Abandoned Underground Storage Tanke	ğ	×		XXX	XXX				
23. Minth Transportation Shop	×	ä		XXX	хох				
24. Landfill No. 4	×			XXX	XXX				
Legend: X = Completed in previous studies XX = Conducted in this stage (Stage 2-1) XXX = To be completed in Stage 2-2, if necessary	ne studies itage (Stage Stage 2-2,	1 2-1) 1f necessar		 Not applicable To be complet 	ible pleted in f	N/A = Not applicable (blank) = To be completed in future tasks, if necessary	if necessar	>	

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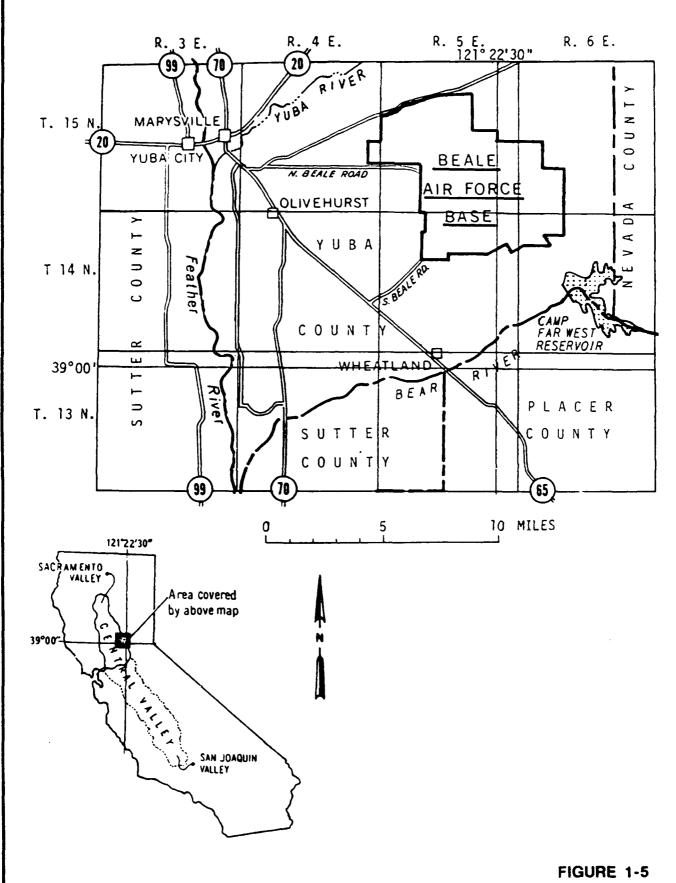
In addition to IRP activities associated with the major Phases/Stages discussed above, additional work was conducted at Site 2 - Photo Wastewater Treatment Plant in 1985. Radian Corporation began installing four groundwater monitoring wells in February 1985 and completed well sampling in August 1985. A report summarizing the groundwater sampling results was completed in October 1985.

	Table 1-4 REPORTS FOR STAGE 2-1	ACTIVITIES	
Report	First Draft	Second Draft	Final
Remedial Investigation Technical Report (all sites)	August 1989	January 1990	January 1991
TPCA Waste Characterization Report (Sites 2, 3, 20)	February 1989	N/A	March 1989
TPCA Hydrogeologic Assessment Report (Site 19)	July 1989	December 1989	January 1991
SWAT Report (Sites 6, 13, 15)	June 1989	December 1989	January 1991

1.3 BASE DESCRIPTION, HISTORY, AND WASTE MANAGEMENT PRACTICES

1.3.1 DESCRIPTION OF THE INSTALLATION

Beale Air Force Base is in Yuba County between the Bear and Yuba Rivers, 10 miles east of Marysville, California (Figure 1-5). It is approximately 40 miles north of Sacramento and 130 miles northeast of San Francisco, California. The base is comprised of approximately 22,944 acres of land in the Sacramento Valley and the lower foothills of the Sierra Nevada. The western portion of the base is relatively flat, annual grassland, while the eastern portion of the base ranges in elevation from 70 to 400 feet, with valley and foothill woodlands.



SOURCE: GROUNDWATER CONDITIONS AT BEALE AIR FORCE BASE AND VICINITY, CALIFORNIA. U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 80-204. PAGE, 1980 LOCATION OF BEALE AIR FORCE BASE

- СЖМНІЦ.-

1.3.2 BASE HISTORY

The Department of Defense installation that is now Beale Air Force Base (AFB) opened in October 1942 as the U.S. Army's Camp Beale. The 13th Armored Division was the first unit to actively train there. However, during the course of World War II, the 81st and 96th Infantry Divisions also trained there. In addition, the camp was used as a personnel replacement depot and prisoner-of-war encampment. It was the site of a 1,000-bed hospital and, at the end of the war, was used as the west coast separation center.

During World War II, the camp supported a military population of more than 60,000 personnel. In 1947, Camp Beale was declared surplus by the War Department, and the War Assets Administration assumed custody. In early 1948, it was transferred to the USAF. Until 1951, the base was used for bombardier-navigator training.

In 1951, the Department of the Air Force redesignated the Beale Bombing and Gunnery Range as "Beale Air Force Base." During its early USAF years, it underwent a number of jurisdictional changes, being at times part of the Air Training Command, the Aviation Engineer Force, and finally the Strategic Air Command. By 1958, Beale's first runway was operational.

In July 1959, Beale received its first KC-135 jet Stratotanker, which was assigned to the 903rd Air Refueling Squadron of the 456th Bombardment Wing. In September 1959, Beale became the support base for three Titan I missile sites. In 1960, B-52s were assigned to the base. In 1965, the Titan I missile program was inactivated, and the 4200th Strategic Reconnaissance Wing, which would man and maintain the SR-71, was activated.

In 1976, as a result of a major reorganization at Beale, all B-52 aircraft were reassigned. At the same time, the 9th Strategic Reconnaissance Wing gained U-2 aircraft and the 99th Strategic Reconnaissance Squadron. The 9th Strategic Reconnaissance Wing (SRW) flies three unique aircraft, the SR-71, the TR-1, and the U-2. Training missions, principally, are flown from Beale. The mission of the wing is to

^{&#}x27;The information presented in this section was taken primarily from the Engineering-Science Phase I IRP Report and onsite observations and interviews during Phase II - Stage 1. References are given in Appendix C.

provide the capability of sustaining continuous reconnaissance operations and to develop and maintain a capability of conducting peacetime global reconnaissance operations.

In 1979, a phased-array radar system was installed. The 10-story radar is a detection and early warning system for sea-launched ballistic missile attacks on the continental United States.

1.3.3 PAST WASTE MANAGEMENT PRACTICES

Sources of hazardous wastes at Beale AFB have included the following activities:

- o Industrial operations
- o Pesticide utilization
- o Fire protection training
- o Management of fuels
- o Spill management
- o Hazardous waste treatment and storage

These activities, the types of wastes generated, and past waste management practices are described below.

1.3.3.1 Industrial Operations

Industrial operations at Beale AFB consist primarily of aircraft and vehicle maintenance and repair activities. The wastes generated include contaminated jet fuel, waste oils and lubricants, acid and alkaline cleaning solutions, solvents, paint strippers, and paints.

In the past, flammable chemicals such as oils, fuels, and solvents were burned in the fire protection training areas. In the late 1960s, this practice was limited to fuels because stricter air pollution control regulations were imposed.

After this time, waste solvents and oils were accumulated in two 2000-gallon underground storage tanks at the fire training area and hauled off site by contractors of the Defense Property Disposal Office (DPDO), now the Defense Reutilization and Marketing Office (DRMO). Contaminated jet fuels were recycled, downgraded, or burned in fire protection training exercises.

In the list, unknown quantities and types of chemical wastes were reported to have been disposed by discharge to the sanitary or storm sewers. Other wastes were allowed to run off

onto surface soils directly adjacent to maintenance facilities, and in some cases, wastes were discharged directly to the land. Some oils, paints, and solvents were disposed in the base landfills. Sludge from the photo wastewater treatment plant was disposed in the base landfills from 1967 to 1978.

1.3.3.2 Pesticide Utilization

The pest control program at Beale AFB involves routine and specific job order applications of pesticides. Pesticides are stored in a locked and covered area of the Entomology Shop in Building 2560. Before 1981, the Entomology Shop was located in Building 440. Some herbicides were stored and applied by the Pavement and Grounds Shop (Building 2565) prior to 1980.

Prior to 1987, pesticide equipment rinsing and cleaning at Building 2560 occurred on gravel-covered natural ground at the side of the building, allowing the rinse water to either evaporate or seep through the gravel into the ground. However, concerns about the underground contamination potential of this practice resulted in the construction of a bermed, concrete washing and mixing area and a 500-gallon holding tank. Pesticide mixing and equipment rinsing has been a closed-system operation within this new facility since August 1987.

Currently, empty pesticide and herbicide containers are usually triple-rinsed and taken to the base landfill consistent with the provisions in 40 CFR 165.9. If triple-rinsing is not feasible, the empty container is turned in to the DRMO at McClellan AFB. Rinse water from triple rinsing is contained and used for dilutent in the preparation of future pesticide/herbicide mixtures.

1.3.3.3 Fire Protection Training

The Base Fire Department has historically operated two fire protection training areas. The first was operated from 1958 to 1971, and the second from 1972 to 1988.

The first area was located approximately 500 feet west of the intersection of J and 27th Streets. Until the late 1960s, combustible waste chemicals were accumulated in a shallow 2-foot-deep basin in the training area. These chemicals reportedly included waste oils, spent solvents, and aviation fuel. Chemicals were accumulated weekly and burned in the basin. Other chemicals were accumulated in

55-gallon drums and burned in the same basin. The basin area did not have a liner system nor was there any preapplication of water to prevent waste chemicals from percolating into the soil. The materials were applied directly to the soil and ignited.

The second fire protection training area was located about 250 feet northwest of the first. Only contaminated jet fuel was burned, and the burn area was first saturated with water before the fuel was applied to impede fuel infiltration. Following direction by the EPA, fire protection training activities ceased in this area and it is being decommissioned.

Fire training is currently conducted on a smaller scale using a concrete-lined pit located approximately 400 yards west of the second fire protection training area.

1.3.3.4 Management of Fuels

The fuel management system at Beale AFB has historically involved the handling of substantial volumes of jet fuels, diesel fuel, motor vehicle gasoline, unleaded gasoline, and No. 2 fuel oil. Fuels are delivered by pipeline, train, or truck to on base storage tanks. Jet fuels are pumped through a pipeline to hydrant systems for refueling aircraft. Trucks are also used to refuel aircraft.

Currently, fuel storage tanks are checked on a periodic basis to determine if cleaning is required. When cleaning is required, the tanks are emptied to other available storage. Contaminated fuel is recycled or used in fire protection training. An off base contractor conducts the tank cleaning operations and removes and disposes of any resulting sludges.

1.3.3.5 Spill Management

Historically, small spills of fuels and oils have occurred in maintenance and shop areas. These spills were contained with absorbent materials, washed into oil-water separators (connected to the sanitary sewer), or washed down storm drains. Fuel spills occurring along the flightline areas were washed down with large volumes of water. This water was either channeled directly into the surface drainage system or allowed to evaporate.

1.3.3.6 Hazardous Waste Storage

Several areas around Beale AFB have been designated for the storage of hazardous waste. Many hazardous wastes, such as oils and solvents, have been temporarily stored in drums and bowsers at the point of generation. When a sufficient quantity of these wastes have been accumulated, they have been transferred to bulk hazardous waste storage areas, which include drum storage areas and aboveground and underground storage tanks.

1.4 SITE-SPECIFIC BACKGROUND INFORMATION

This section describes the 24 sites of concern at Beale AFB. The locations are illustrated in Figure 1-6 and, in greater detail, in Plate 1. Site names are listed in Table 1-5. For each site, setting and location; waste sources, types, and concentrations; migration pathways; and potential receptors are discussed. These descriptions are based on data collected through the Phase II - Stage 1 (AeroVironment) study. Information given in the site descriptions does not include results for the current Stage 2-1 study. These results are given in Section IV of this report.

1.4.1 SITE 1: WEST DRAINAGE DITCH

1.4.1.1 Site Setting and Location

The West Drainage Ditch (Figure 1-7) drains runoff from the flightline and surface runoff from the runway area. Three 66-inch-diameter pipes discharge through a headwall about 2,000 feet west of the flightline, into a ditch filled with vegetation. Since 1984, oil absorbent booms have been placed immediately downstream from the headwall. The headwall structure is being upgraded incorporating a cement apron and a weir that will detain floating hydrocarbon products. Construction is scheduled to be completed in January 1991. Past surface water quality data indicated oil and grease and trans-1,2 dichloroethane in water discharged to the ditch. Banks of the ditch are oil stained for about 75 feet downstream of the headwall.

West Drainage Ditch is located less than 1,000 feet from the base boundary. Ditch water occasionally flows off base during the wet season (October through April). This presents a potential for environmental contamination outside the base boundary. The site is also less than 1 mile from off base

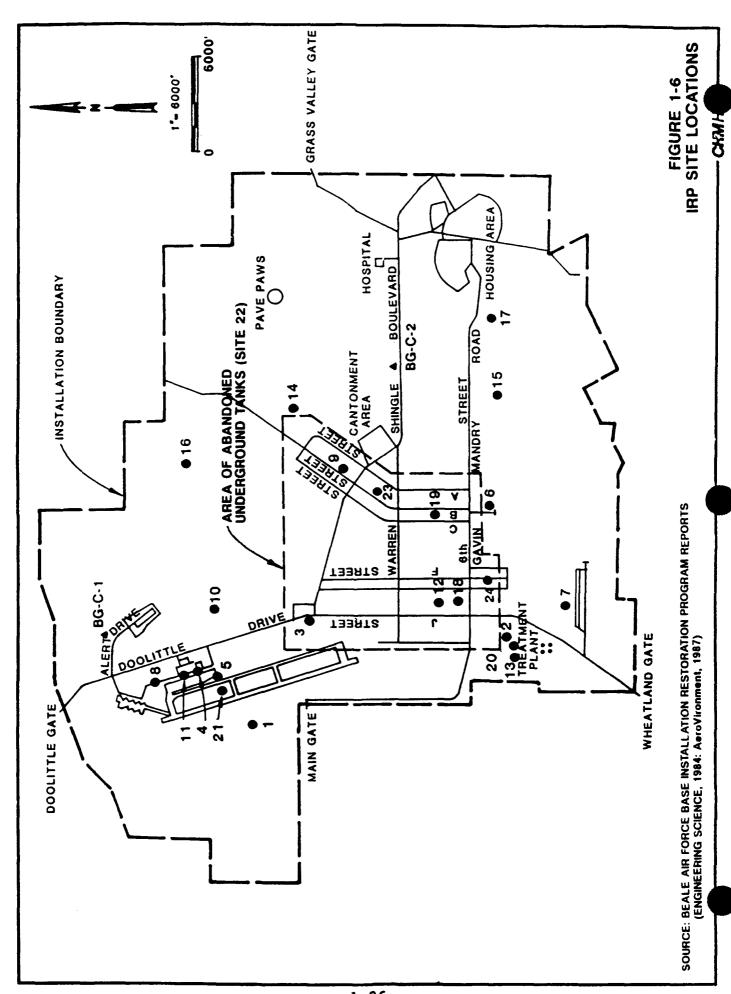


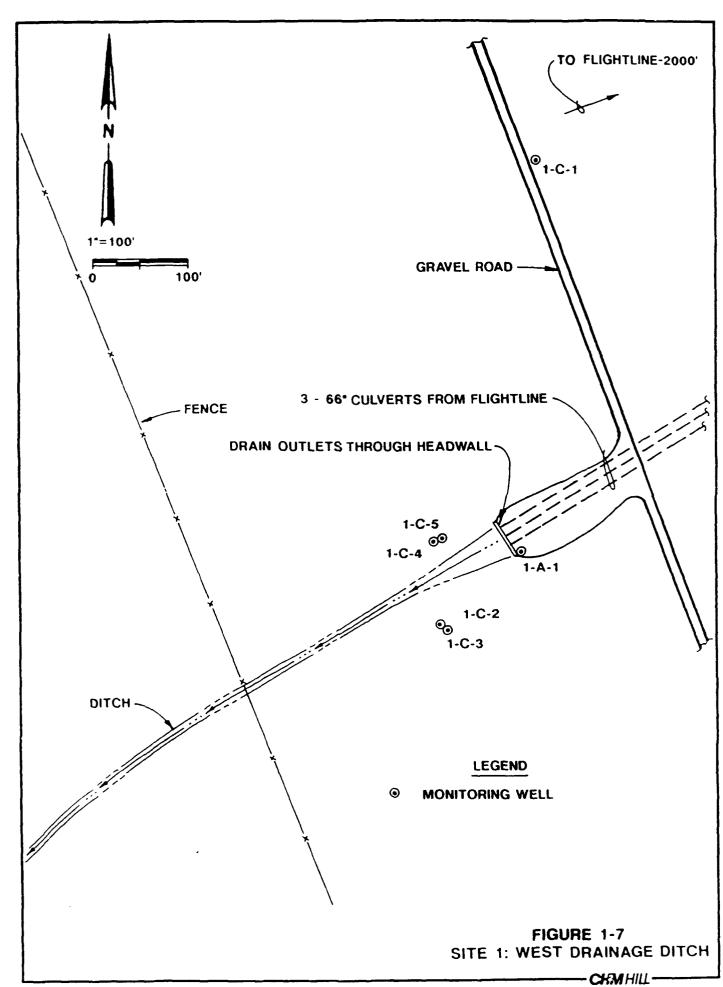
Table 1-5 IRP SITES AT BEALE AFB

Site <u>Number</u>	Site Name
1	West Drainage Ditch
2	Photo Wastewater Treatment Plant, Injection Well, and Sludge Basins
3	Fire Protection Training Areas
4	Battery Shop Dry Well
5	SR-71 Shelters Drainage Area
6	Landfill No. 2
7	Army Biological Production Area
8	J-57 Test Cell
9	Entomology Building 2560
10	J-58 Test Cell
11	Aircraft Ground Equipment Maintenance Area
12	Entomology Building 440
13	Landfill No. 1
14	Transformer Drainage Pit
15	Landfill No. 3
16	Explosive Ordnance Disposal (EOD) Area
17	Best Slough
18	Bulk Fuel Storage Facility
19	Photo Waste Emergency Holding Basin

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Table 1-5 IRP SITES AT BEALE AFB (Continued)

Site <u>Number</u>	Site Name
20	Grease Pit (Sanitary Treatment Plant)
21	JP-7 Aboveground Fuel Storage Tanks (Flightline)
22	Abandoned Underground Storage Tanks
23	Ninth Transportation Refueling/Maintenance Shop
24	Landfill No. 4



residences along North Beale Road that use groundwater for domestic purposes. Surface soils in the area are mediumtextured clay with characteristically low permeability.

1.4.1.2 Waste Sources, Types, and Concentrations

Runoff from the flightline and runway area, including the SR-71 shelter area (Site 5), is the main source of contaminants. It is composed of jet fuel, oil, and solvents. Up to 18,000 ug/l (ppb) of oil and grease was detected by AeroVironment in the surface water near the drain outlet to the ditch. Bottom sediment contained up to 33,000 mg/kg (ppm) of oil and grease and 410 mg/kg (ppm) of lead. Although not detected in surface water samples, trichloroethylene (TCE) concentrations of 100 ug/l (ppb) were found in groundwater.

1.4.1.3 Migration Pathways

Contaminants are carried to the West Drainage Ditch via underground culverts from the flightline area. Fuels, oils, and solvents, dissolved or suspended in water, are discharged to the drainage ditch.

Contaminants exist in surface water and are carried downstream during high flow conditions. Contaminants are present in ditch sediments. The Stage 1 report speculated that contaminated sediments may be a result of deposition of contaminated suspended soils discharged from the drainage culvert. The degree and extent of vertical soil contamination is unknown.

Samples from AeroVironment well 1-A-1 indicates that the groundwater was contaminated with TCE, which is a mobile compound and may have been either carried downward with percolating ditch water or transported in the groundwater from upgradient sources. The extent of this contamination is unknown.

1.4.1.4 Potential Receptors

If groundwater contamination affects the quality of water in base production wells, the base population could potentially be exposed to contamination through groundwater ingestion. Likewise, if groundwater contamination affects any off base private wells, neighboring residents, their livestock, and crops could potentially be exposed. The 9 base production wells, about 6,000 feet west of the site, range in depth

from about 300 to 400 feet. The screened intervals range in depth from 112 to 330 feet (Page, 1980). Well head elevations were not available.

Because the West Drainage Ditch area is not fenced, wildlife could potentially use the contaminated surface water and thereby be exposed.

1.4.2 SITE 2: PHOTO WASTEWATER TREATMENT PLANT, INJECTION WELLS, AND SLUDGE BASINS

1.4.2.1 Site Setting and Location

The photo wastewater treatment plant (PWTP) was used from 1966 to 1990 to treat photo development wastewater. It is located on the southwest portion of the base and receives wastes from the photo laboratory (Building 2145) 2.5 miles to the northeast. The site is illustrated in Figure 1-8 and an analysis of wastewater components is given in Table 1-6.

Average waste flow was 20,000 gallons per day. Treatment processes included equalization, chemical flocculation, settling, and filtration. Three injection wells were used for PWTP effluent disposal until injection was discontinued in April 1986. In 1989 the injection wells were completely pressure grouted and abandoned. The zone of injection (1,000 to 1,200 feet below land surface) is not part of past or proposed IRP studies. Since 1986, PWTP effluent has been pumped to the sanitary treatment plant. In addition, two unlined sludge ponds were used for PWTP sludge disposal from 1974 to 1990.

The photo laboratory now has a closed loop water system and no longer discharges water to the PWTP. The PWTP is being decommissioned. Use of the unlined sludge ponds was discontinued in April 1990. Beale AFB is going through RCRA closure for the ponds with a Federal Facilities Compliance Agreement with the USEPA.

Concern at Site 2 results from the unlined ponds and the discharging of pentachlorophenol-treated PWTP effluent onto the ground around the PWTP and near the injection well heads. From 1967 until 1984, whenever the treatment plant shut down for maintenance, 500 to 2,000 gallons of effluent treated with pentachlorophenol (PCP) were discharged onto the ground in the vicinity of the injection wells. This procedure was conducted 12 times a year to flush out corrosion in the pipelines.

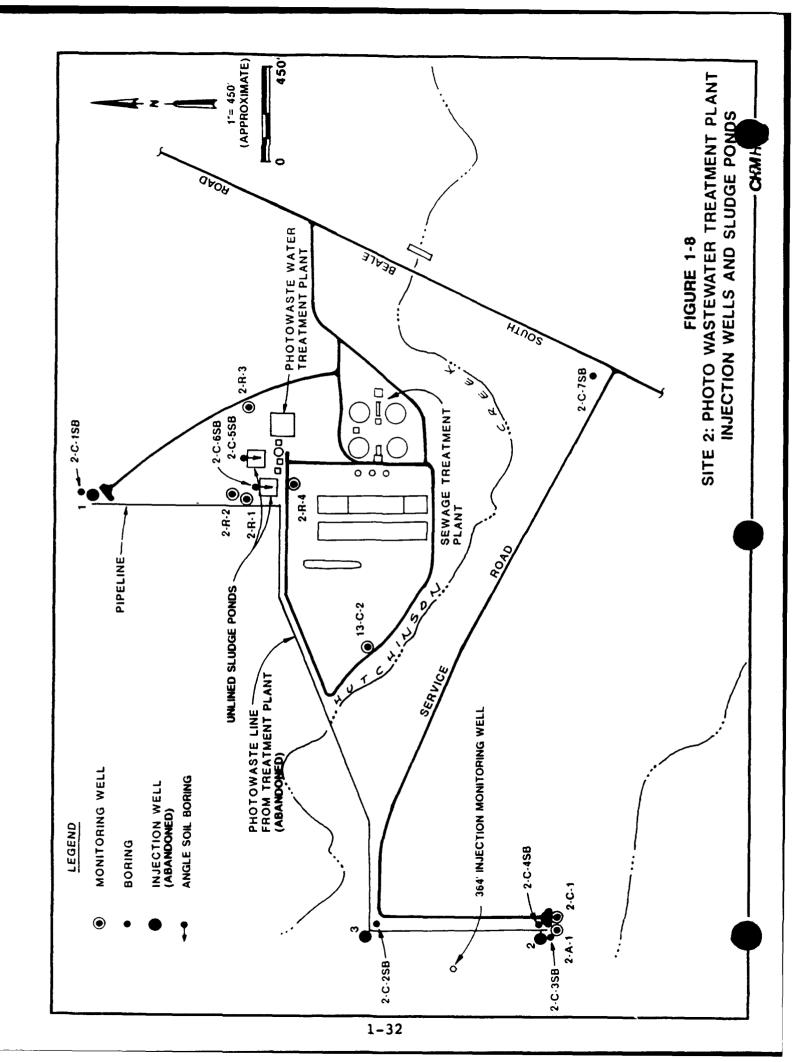


Table 1-6
PHOTOWASTE SUMP SAMPLE ANALYTICAL RESULTS

Parameter	Value (mg/l)
pH (pH units)	7.8
Specific Conductivity (umhos/cm)	1,050
Thiosulfate	760
Biochemical Oxygen Demand	148
Chemical Oxygen Demand	2,000
Hydroquinone	0.039
Total Suspended Solids	10
Total Dissolved Solids	960
Cyanide (free)	NDa
Cyanide (total)	ND
Boron (total)	0.0248
Chromium (total)	0.008
Chromium (+6)	0.0011
Bromide	2.0
Silver	2.24
Zinc	0.060
Iron	0.38
Potassium	79
Sodium	34
Cadmium	0.030
Total Organic Carbon	200

aND = Not detected

NOTE: Sample collected in August 1982.

This site (plant, ponds, and injection wells) is approximately 500 feet from the base boundary and less than 500 feet from Hutchinson Creek.

1.4.2.2 Waste Sources, Types, and Concentrations

Discharge of PCP-treated effluent on the ground surface and disposal of PWTP sludge in unlined ponds are the main waste sources. Waste types include photo wastes containing trace metals, phenolics, benzene, oil and grease, and PCP. During the AeroVironment study no PCP was found in the upper 12 feet of soil near the injection well heads. In one sample from 16.5 feet below ground surface (BGS), PCP concentration measured 30 mg/kg (ppm). Insufficient information exists regarding groundwater near the injection well heads, though 2 ug/l (ppb) of phenol was measured in one groundwater sample of first water encountered (100 feet BGS). Concentrations measured in groundwater downgradient of the sludge ponds show 5 ug/l (ppb) phenol, 80 ug/l (ppb) chromium, and 0.9 ug/l (ppb) benzene. Sludges and soils beneath the sludge ponds were not sampled in previous IRP studies.

1.4.2.3 Migration Pathways

Chemicals in photo wastewater, including PCP, may have contaminated soils in the vicinity of the injection well heads due to line discharges. PCP was detected at 16.5 feet below land surface at one well head. The horizontal and vertical extent of this impact is unknown. Contaminants may have been carried downward through surface soils and accumulated on top of a clay layer.

Photo waste sludges are stored in unlined ponds. When first pumped to the ponds, the sludge has a high water content. Also, during winter months, precipitation adds water to the ponds. Contaminants may have percolated into the soils beneath the ponds and possibly to groundwater. Although groundwater in the area does contain contaminants, the source(s) of these contaminants have not been confirmed.

Spillage of photo wastewater in the vicinity of the PWTP may have carried contaminants into the soil.

1.4.2.4 Potential Receptors

Potential human receptors are base personnel associated with the PWTP, and users of the off base domestic well directly west of the site.

1.4.3 SITE 3: FIRE PROTECTION TRAINING AREAS

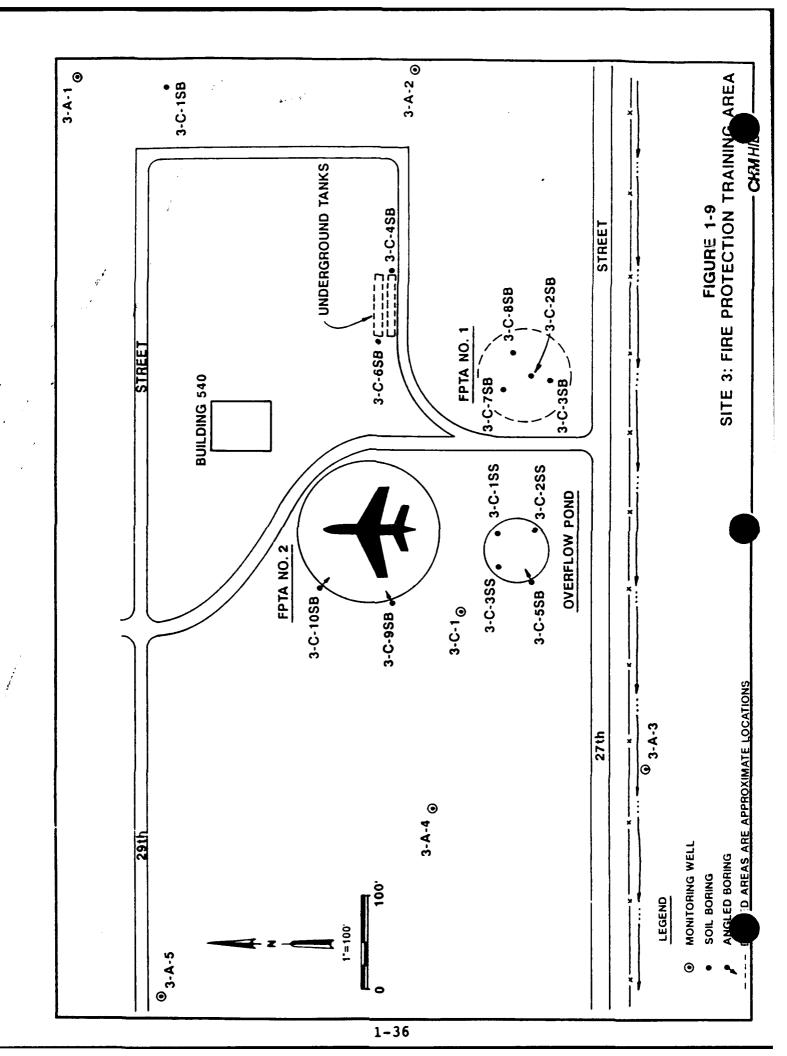
1.4.3.1 Site Setting and Location

Training exercises have been conducted at Fire Protection Training Area (FPTA) No. 1 and FPTA No. 2 since 1958. Because they are located within 250 feet of each other, they have been combined into one IRP site for the purpose of evaluation. The site is illustrated in Figure 1-9.

From 1958 to 1971, the fire department conducted live fire training exercises at FPTA No. 1. This site is located in the half-acre adjacent to the intersection of J and 27th Streets. Until the late 1960s, combustible waste chemicals were accumulated in a shallow, unlined 2-foot-deep basin in the FPTA. These chemicals were reported to have included waste oils, spent solvents, and aviation fuel. These chemicals were burned weekly in the basin. Other chemicals were accumulated in 55-gallon drums and burned in the same basin. The basin area did not have a liner, nor was there any preapplication of water to prevent the percolation of waste chemicals into the soil. The materials were applied directly to the soil and ignited (Engineering-Science, 1984). There is currently no visual evidence of FPTA No. 1. FPTA No. 2, located northwest of FPTA No. 1, began operating in 1972 when use of FPTA No. 1 was discontinued. FPTA No. 2 consists of a shallow unlined basin 150 feet in diameter surrounded by a 12-inch berm. Inside the basin is a mock aircraft which was used for fire training exercises. 100 feet south of the mock aircraft is an unlined basin designed to hold liquid drained from FPTA No. 2. Fire training exercises involved simulated fires in and around the mock aircraft, using contaminated jet fuel on an area first saturated with water. Residual fuel and water are left in the unlined basin south of the FPTA.

Following direction by the EPA, fire protection training activities ceased at FPTA No. 2 in 1988 and it is being decommissioned. Fire training is currently conducted on a smaller scale using an 8-foot by 10-foot concrete-lined pit located approximately 400 yards west of FPTA No. 2.

There are two 25,000-gallon underground storage tanks located at the FPTA. They are designated as the north tank and the south tank. The north tank contains jet fuel that was used by the base fire department for live fire training in the adjacent fire pit. The south tank has traditionally



contained contaminated fuel, hydraulic fluid, and waste solvents. Underground fuel lines run from the tanks to the fuel nozzles at the airplane mock-up in the fire pit.

The only recorded spill incident at the FPTA occurred in May 1983. Fluid from the north tank was inadvertently pumped out of the tank and onto the ground. The intent was to provide additional tank capacity for a leak check. Three months earlier, the base had analyzed its contents (through lab facilities at USAFOEHL, presently AFSC) and reported that liquid from the north tank contained lead and chromium levels of 10 and 5.5 mg/l (ppm), respectively. The discharge of this liquid onto the ground subsequently created concern about soil contamination with lead and chromium. Appropriate regulatory agencies were notified of the spill. Subsequent soil testing did not indicate the need for any remedial action.

The site is located within I mile of the base boundary. Surface soils in the vicinity of the FPTA contain clay, which has relatively low permeability.

1.4.3.2 Waste Sources, Types, and Concentrations

Contaminant sources at this site are the fire training pits, spills associated with the pits, and underground storage tanks. Contamination types are waste oils, spent solvents, and jet fuel. No contamination was detected in groundwater samples from five AeroVironment wells during IRP Phase II, Stage 1 sampling. Oil and grease were detected in surface soils inside the berm at FPTA No. 2 and near the underground tanks. Oil and grease concentrations between the surface and 16-feet depth measured 800 mg/kg (ppm). Volatile organics (xylene) measured 1 mg/kg (ppm). Soils inside FPTA No. 2 exhibited oil and grease concentrations up to 4,900 mg/kg (ppm), petroleum hydrocarbons up to 4,600 mg/kg (ppm), and volatile aromatics at detectable levels (AeroVironment, 1987). No previous information was available for FPTA No. 1 as it was not located or sampled during the Stage 1 investigation.

1.4.3.3 Migration Pathways

Hydrocarbon contaminants have been introduced to the surface soils at three locations. At each of these locations, contaminants have probably caused soil impacts but the horizontal and vertical extent is unknown. It is possible that contaminants may spread horizontally on clay layers reported to be present in this area (AeroVironment, 1987).

Groundwater contamination has not been detected in existing wells but it is possible that the wells are incorrectly positioned or are too far away from the source.

1.4.3.4 Potential Receptors

Potential receptors include firefighters in training and base personnel handling wastes in pits and waste disposal. Groundwater contamination is a possibility, even though it was not observed during Phase II, Stage 1 activities. If groundwater is, or becomes contaminated, domestic well users west of the base may become receptors.

1.4.4 SITE 4: BATTERY SHOP DRY WELL

1.4.4.1 Site Setting and Location

From 1972 to 1983, approximately 24 gallons per month of neutralized lead battery acid were discharged to this dry well (AeroVironment, 1987), which is adjacent to the Battery Shop (Building 1088; see Figure 1-10). The neutralized acid may have had high lead concentrations. The dry well is 4 feet in diameter and approximately 20 feet in depth, and is filled with cobblestones. Use of the dry well was discontinued in 1983.

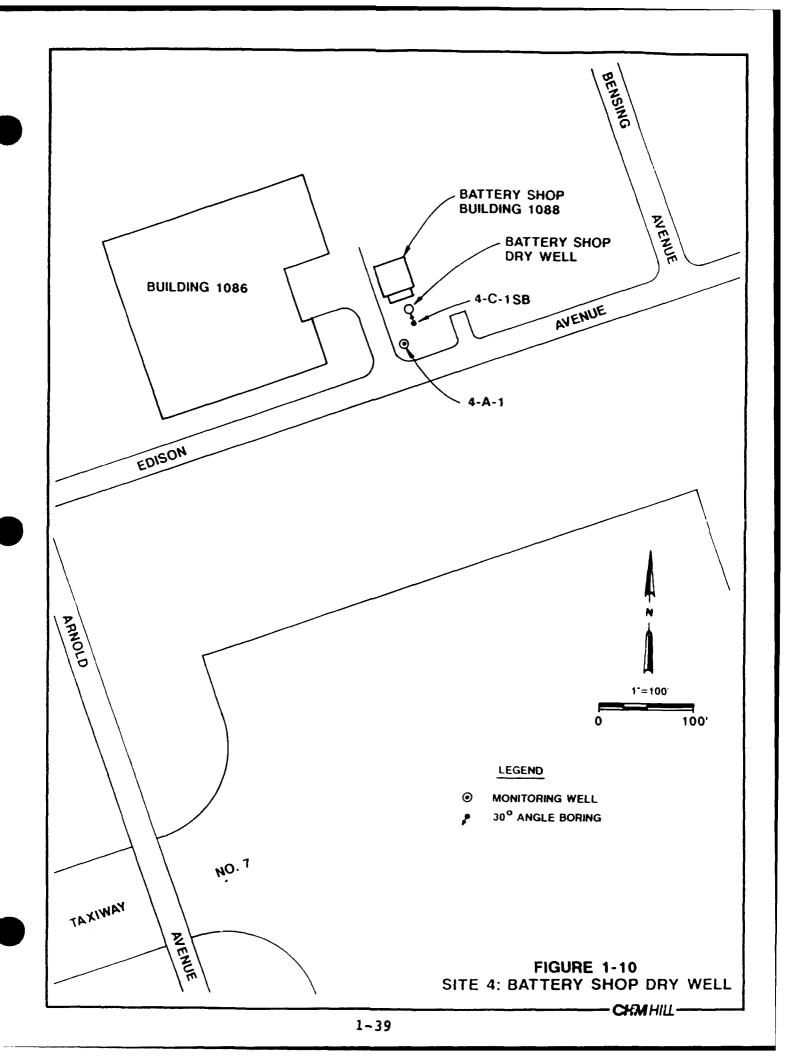
1.4.4.2 Waste Sources, Types, and Concentrations

The source of waste at Site 4 was the discharge of neutralized lead battery acid. The waste type is lead and inorganic compounds from the battery acid. No contamination was detected in groundwater samples from the one monitoring well installed by AeroVironment.

1.4.4.3 Migration Pathways

Relatively low volumes (approximately 24 gallons per month) of waste fluids were disposed of in the dry well. A discolored zone detected between 45 to 50 feet BGS may have been caused by the horizontal migration of waste fluids on top of a clay lens or within a higher permeability unit (AeroVironment, 1987). Color may be due to precipitation of metals.

Groundwater contamination has not been detected in the one existing well. Either contaminants did not reach groundwater in measurable concentrations, or contaminants have been transported downgradient and are no longer present in the site area because the source of contaminants no longer



exist. It is also possible that the one well is improperly positioned to intercept contamination. Groundwater flow is estimated to be to the west southwest at Site 4.

1.4.4.4 Potential Receptors

If the fluids disposed of down the dry well have contaminated groundwater, users of domestic wells to the west of the base or users of the base supply wells may be receptors. Based on waste types and quantities, this is considered to be unlikely.

1.4.5 SITE 5: SR-71 SHELTERS DRAINAGE AREA

1.4.5.1 Site Setting and Location

From 1966 to 1989, ground operation of SR-71 aircraft resulted in about 300 gallons per week of JP-7 jet fuel being leaked onto the hangar floors and shelter apron area (Engineering Science, 1984). Some fuel ran off the taxiway into an oil-water separator. Water from the separator was discharged via pipelines to the West Drainage Ditch (Site 1). Runoff also flowed onto soil and gravel between the SR-71 shelter apron and flightline taxiways (Figure 1-11).

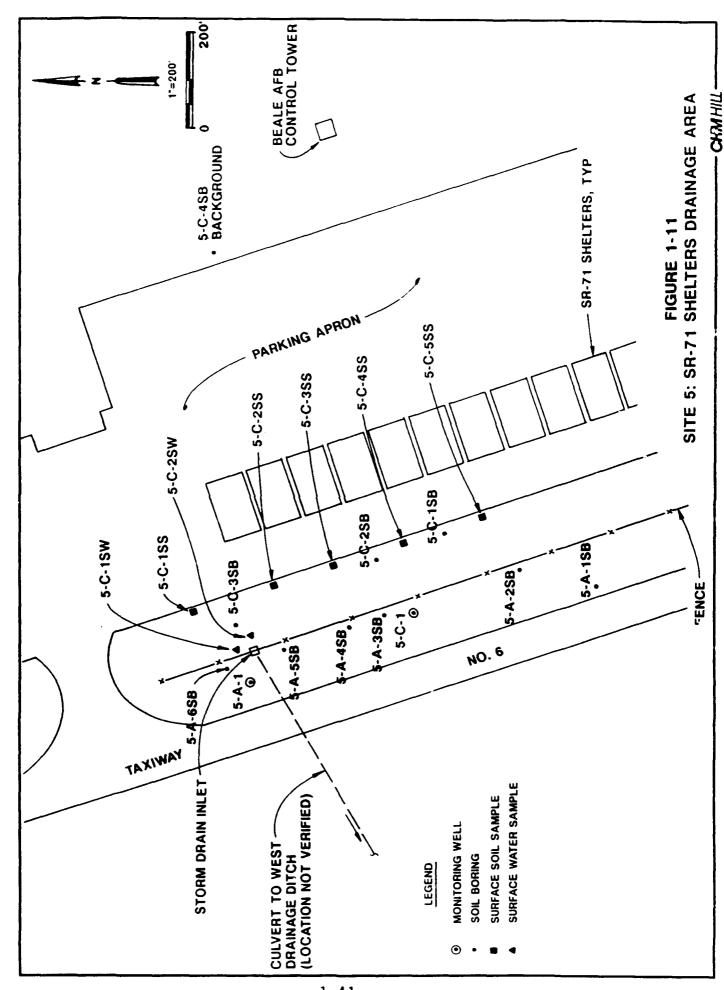
1.4.5.2 Waste Sources, Types, and Concentrations

JP-7 jet fuel leakage was the principal waste source at Site 5. Based on IRP Phase II, Stage 1 findings, hydrocarbon concentrations in the soil ranged from 400 to 4,000 mg/kg (ppm), with highest concentrations present in the north borings near the storm drain inlet. Depth of contamination is unknown. No contamination was detected in sampled groundwater.

1.4.5.3 Migration Pathways

Petroleum contaminants were transported to the surface soils by precipitation runoff and SR-71 hangar floor washing operations. In the past, all of the contaminants either percolated into the soils or were transported to the drainage culvert leading to the West Drainage Ditch (Site 1). Surface soil contaminants have been detected but the vertical and horizontal extent is unknown.

Currently, runoff water is channeled by curbs and lined ditches to an oil/water separator. It is not known how effective these flow controls are in preventing further soil



contamination. The oil/water separator and associated curbs and channels were upgraded in 1990 to more effectively capture runoff from a larger area. Oil absorbing booms have been installed around the oil/water separator.

Contaminants in the soil may be carried by percolation of surface water to the groundwater, although no contamination has been detected in the one existing well (5-A-1) installed by AeroVironment.

1.4.5.4 Potential Receptors

Base personnel working in the area are the primary potential human receptors at this site. However, this site is upstream from and contributes flow to Site 1, the West Drainage Ditch. Contaminants from Site 5 may be carried to Site 1 where they may be transported by surface water flow or percolate into ditch sediments and downward to groundwater. Therefore, Site 5 has the same potential receptors as Site 1.

1.4.6 SITE 6: LANDFILL NO. 2

1.4.6.1 Site Setting and Location

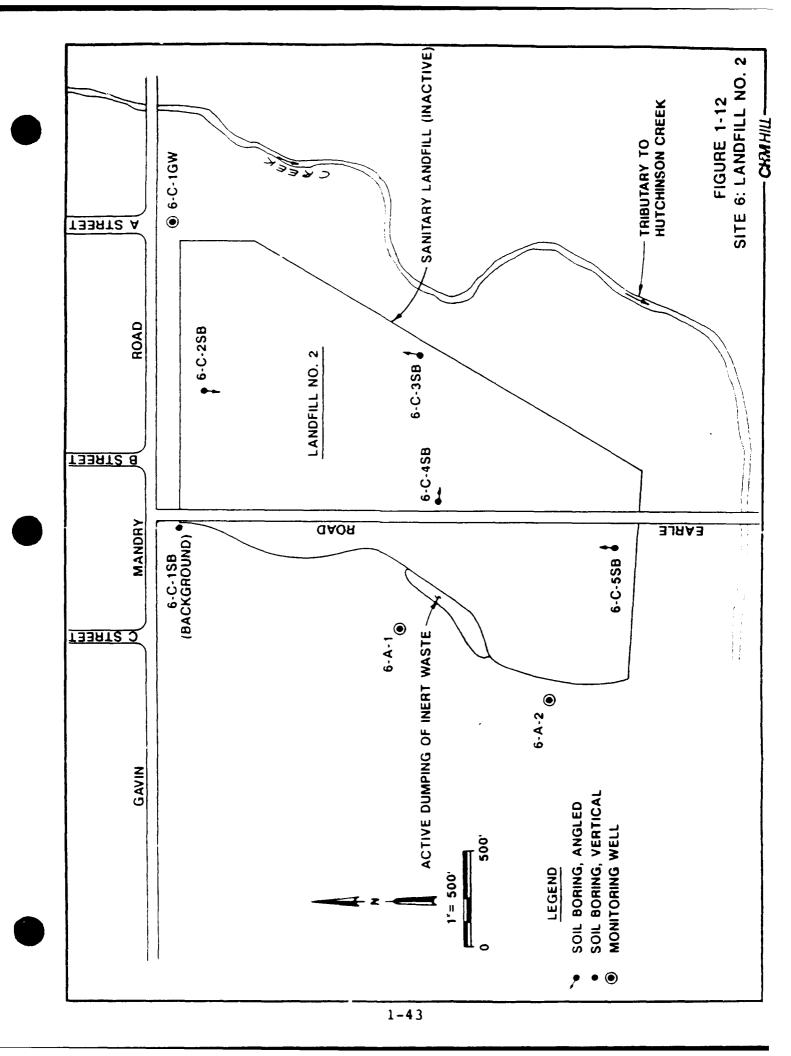
Landfill No. 2 occupies 56 acres in the southern sector of the base. It is located just south of 6th Street near the intersection with Earle Road. It was used primarily for refuse disposal from the early 1950s until 1980. Between 1967 and 1978, about 380 cubic yards of sludge from the photo wastewater treatment plant (Site 2) were disposed here. Small amounts of chemicals and petroleum were also disposed in Landfill No. 2 (Engineering Science, 1984). It is now used to dispose of dirt, wood, and other construction and grounds maintenance debris. Site 6 is shown in Figure 1-12.

1.4.6.2 Waste Sources, Types, and Concentrations

Domestic and base refuse, PWTP sludge, and some chemical waste are the waste sources and types found at Landfill No. 2. No groundwater contamination was detected in samples from two AeroVironment wells (6-A-1 and 6-A-2).

1.4.6.3 Migration Pathways

Water percolating into the landfill, especially during winter months, may cause leachate generation and migration through subsurface soils to groundwater. No groundwater



contamination has been detected in wells installed during Phase II, Stage 1.

Landfill gas may also be present within the landfill and may migrate into surrounding soils, especially in coarse-grained soil.

1.4.6.4 Potential Receptors

Landfill No. 2 is no longer used for municipal refuse disposal and landfill trenches have been covered. Dirt, wood, and debris cover parts of the surface of the landfill. Because the landfill is inactive (except for inert wastes) and is covered, no potential receptors exist unless groundwater is, or becomes contaminated. If groundwater is or becomes contaminated, domestic well users west of the base may be potential receptors.

1.4.7 SITE 7: ARMY BIOLOGICAL PRODUCTION AREA

1.4.7.1 Site Setting and Location

The area that once served as the Army Biological Production site is adjacent to the Base Rod and Gun Club, east of the sewage treatment plant.

From 1962 to 1969, the U.S. Army produced wheat stem rust at a biological test site located adjacent to Building 1154, in the southwest corner of the base. In 1969, the production stocks remaining at Beale were destroyed and the material was rendered inactive by chemical treatment and incineration. The residual ash was assayed and plowed into the soil at the site to a depth of 6 inches. The destruction process was accomplished successfully by standards of that time, in cooperation with federal and state agricultural authorities.

The site is currently used as the Base Gun Club. Game birds are housed in large pens throughout the site.

1.4.7.2 Waste Sources, Types, and Concentrations

Sources of wastes include the chemicals used at the site during wheat stem rust production. Types are freon, ethylene oxic and possibly heavy metals and solvents such as trichloroethylene (TCE). Analysis of surface soils in the area for volatile organic compounds and heavy metals indicated that no contaminants were found at concentrations above background levels, with one exception. One sample showed a silver concentration of 12 mg/kg (ppm). AeroViron-

ment concluded that background level of silver was approximately 4 mg/kg (ppm). No further action is being taken at this site.

1.4.7.3 Migration Pathways

Apparently, potential contaminants were either destroyed during incineration, attenuated by the soils, or have been degraded since disposal. No contaminants were detected, and therefore, discussion of migration pathways is not applicable.

1.4.7.4 Potential Receptors

Discussion of potential receptors is not applicable for Site 7 because no contaminants were detected.

1.4.8 SITE 8: J-57 TEST CELL

1.4.8.1 Site Setting and Location

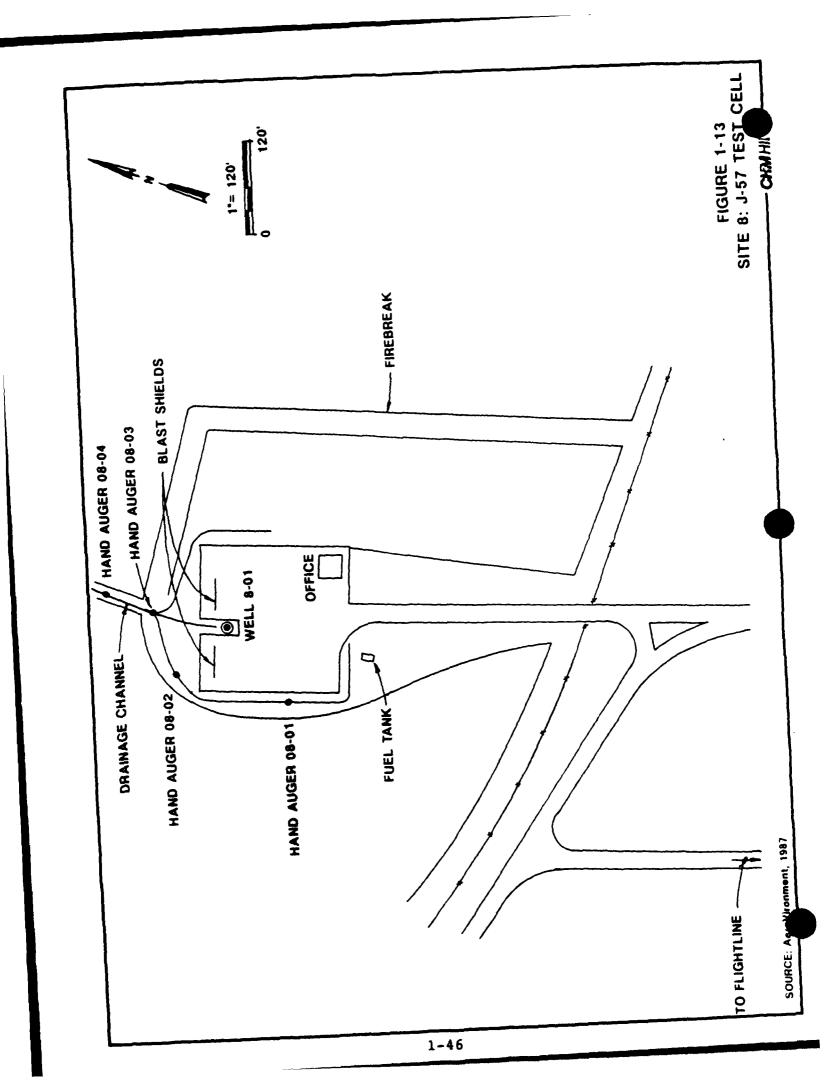
The J-57 Test Cell, which is decommissioned, is adjacent to Building 1247 at the north end of the flightline. It is presently used as a hazardous waste storage facility. Engines from all aircraft flown at Beale, except the SR-71, were tested here. The drainage ditch at this site received runoff from the engine test stand. Soils in the drainage ditch are stained from site runoff. Shop personnel estimate that these discharges have occurred since 1958, but can only confirm their occurrence since 1966. Site 8 is shown in Figure 1-13.

1.4.8.2 Waste Sources, Types, and Concentrations

Spills and runoff from jet engine tests were the main sources at this site. Types of wastes are jet fuel, petroleum distillates, and soaps. Though contamination was not detected in groundwater samples from the one AeroVironment well, 700 mg/kg (ppm) oil and grease and 1,400 mg/kg (ppm) petroleum hydrocarbons were measured in soils.

1.4.8.3 Migration Pathways

During engine repairing and testing, fuels, oils, and solvents were spilled onto the concrete pad. These contaminants were carried to the small ditch around the site by rainfall runoff or cleaning operations. Contaminants percolated into subsurface soils with the water, but



vertical extent is unknown. When sufficient runoff exists, contaminants may flow along the ditch and be discharged to the field north of the site.

1.4.8.4 Potential Receptors

Base personnel involved with jet engine testing, were the most direct potential receptors. If groundwater is or becomes contaminated, base and domestic well users to the west may be potential receptors. If surface water carries contaminants from the site, downstream users and wildlife may be potential receptors.

1.4.9 SITE 9: ENTOMOLOGY BUILDING 2560

1.4.9.1 Site Setting and Location

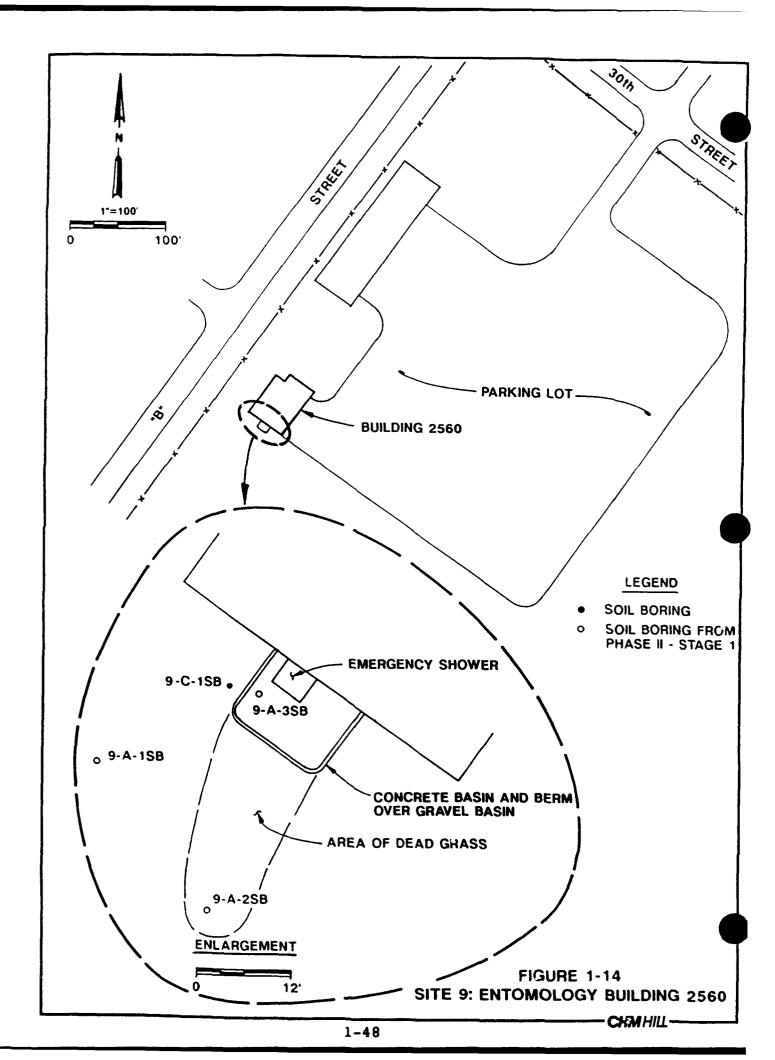
Site 9 was originally a gravel basin located adjacent to Building 2560, inside the fenced Civil Engineering Facility. From 1981 to 1987, rinsate and spillage from storing and mixing pesticides and herbicides and cleaning pesticide containers were discharged onto this gravel area and allowed to evaporate or drain into the soil. Grass does not grow in a small area downhill from the gravel area. This could be the result of the discharges. The gravel basin next to Building 2560 has been covered (1987) with a concrete basin and berm preventing rinsate from contacting surface soils. A roof was built over the concrete basin in 1990. Soils may contain clay which helps retard vertical contaminant migration, but increases surface runoff. Site 9 is shown in Figure 1-14.

1.4.9.2 Waste Sources, Types, and Concentrations

Rinsate and spillage from storing and mixing pesticides and herbicides and from cleaning pesticide containers are the waste sources at this site. Waste types include herbicides and pesticides. Chlordane was the only pesticide detected during the IRP Phase II, Stage 1 work. Its concentration in soil was 0.9 mg/kg (ppm) at 1.5 feet, 0.1 mg/kg (ppm) at 6.5 feet. Base personnel question these results, claiming that records show chlordane was not used at this facility.

1.4.9.3 Migration Pathways

Pesticide and herbicide rinsate was previously discharged to the gravel area and may have percolated into subsurface soils. However, only chlordane was detected and that result was suspect. Contaminants may have precipitated in the



first foot of soil and, therefore, were not detected in deeper samples. It is unlikely that contaminants would have percolated to deeper depths, leaving near-surface soils essentially clean. Groundwater at the site has not been sampled, and does not need to be sampled unless deeper soil borings show evidence of vertical migration of contaminants.

1.4.9.4 Potential Receptors

The gravel area next to Building 2560 has been covered with a concrete basin preventing contact with surface soils. Potential receptors include base and domestic well users to the west, if groundwater has been contaminated. These wells are at least 3 miles downgradient from Site 9. The apparent low levels of contaminants, if any, and the distance to wells make exposure to well users highly unlikely.

1.4.10 SITE 10: J-58 TEST CELL

1.4.10.1 Site Setting and Location

The J-58 Test Cell was used to test the SR-71 jet engines until the SR-71 was returned. It is adjacent to Building 1154 just east of Doolittle Drive. The test cell has been closed. The drainage ditch at the test cell receives runoff from the test stand where tests were conducted. Soils in the adjoining ditch are stained from site runoff. Site 10 is shown in Figure 1-15.

1.4.10.2 Waste Sources, Types, and Concentrations

Spills and runoff from jet engine tests are the primary waste sources. Waste types are jet fuel, petroleum distillates, soap, oil, and TCE. No contamination was detected in the groundwater samples from the one AeroVironment well (10-A-1). Oil and grease concentrations in soil were 1,600 to 4,000 mg/kg (ppm), and petroleum hydrocarbons measured 1,600 to 4,700 mg/kg (ppm).

1.4.10.3 Migration Pathways

The source and migration of contaminants is essentially the same as for Site 8, J-57 Test Cell, except that runoff water is channeled to the south.

1.4.10.4 Potential Receptors

Base personnel involved with jet engine testing, were the most direct potential receptors. If groundwater is or

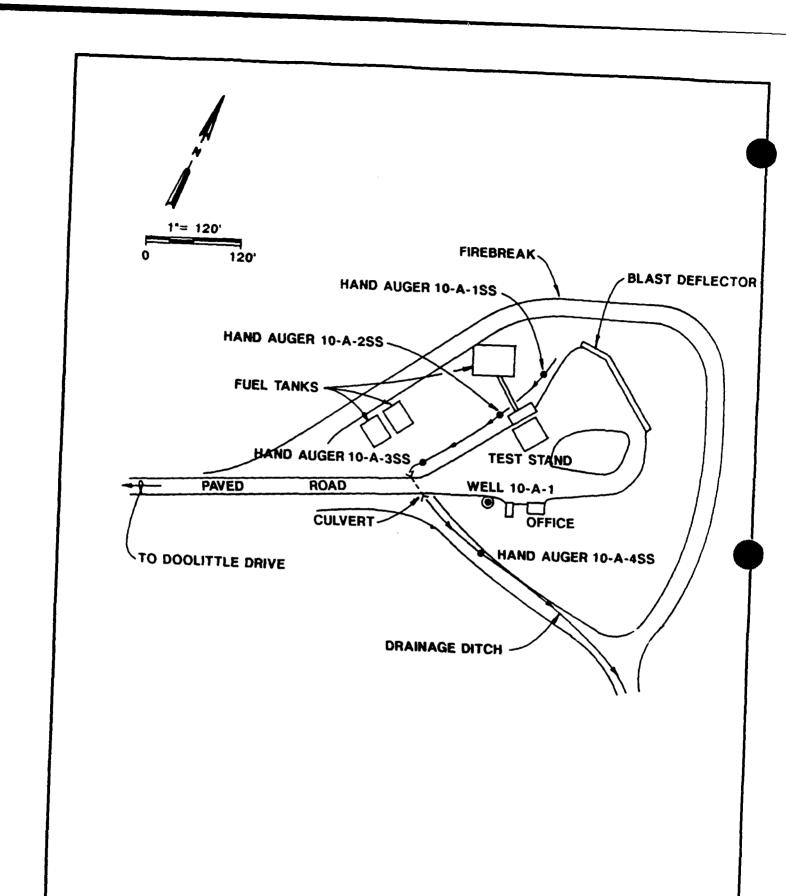


FIGURE 1-15 SITE 10: J-58 TEST CELL

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becomes contaminated, base and domestic well users to the west may be potential receptors. If surface water carries contaminants from the site, downstream users and wildlife may be potential receptors.

1.4.11 SITE 11: AIRCRAFT GROUND EQUIPMENT MAINTENANCE AREA

1.4.11.1 Site Setting and Location

For the past 25 years, aircraft ground support vehicles have been parked on a paved area adjacent to the aircraft ground equipment (AGE) maintenance shop at Building 1225. These vehicles have been known to leak oil and hydraulic fluids. A drainage ditch behind Building 1225 shows evidence of staining, likely from fuel and oil contaminated runoff. Some of the stained soils were removed in 1984, although some discoloration is still visible. Cement berms and an oil/water separator have been installed to control runoff from operations. Site 11 is shown in Figure 1-16.

1.4.11.2 Waste Sources, Types, and Concentrations

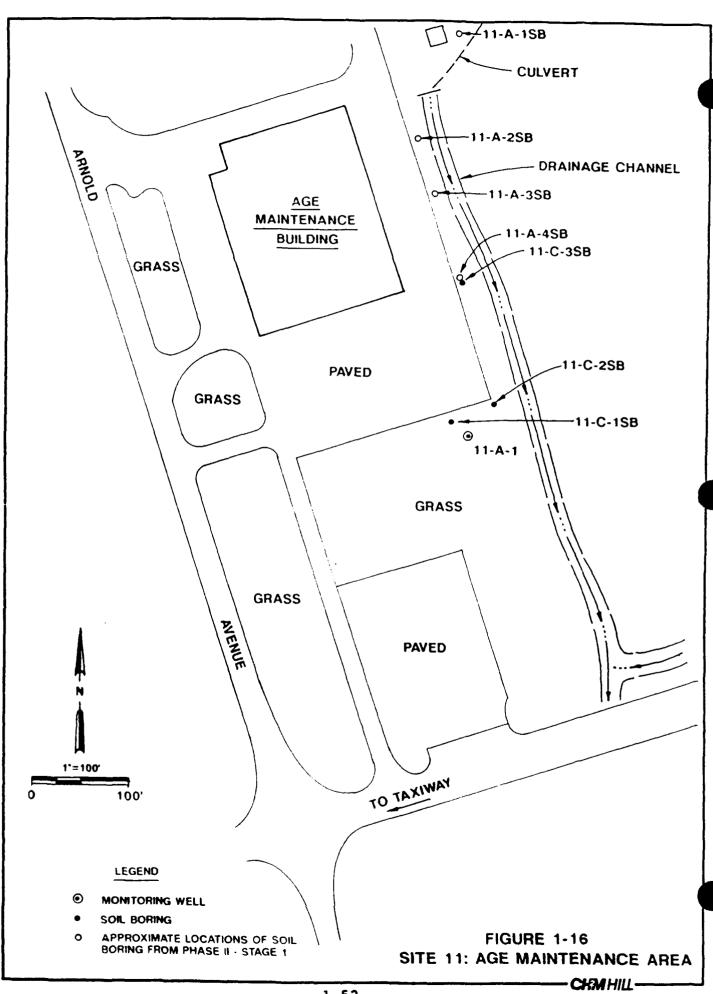
Oil, hydraulic fluids, and fuels from aircraft ground support vehicles are the main sources. Oil, hydraulic fluids, and fuel (gasoline) are the waste types. During IRP Phase II, Stage 1, no contamination was detected in groundwater samples from the one AeroVironment well (ll-A-l), or soils from the drainage ditch. Concentrations in surface soils near the pavement edge were up to 7,000 mg/kg (ppm) for oil and grease.

1.4.11.3 Migration Pathways

Fuels, oils, and possibly solvents leak from parked equipment onto the paved surface. Rainfall runoff or washing operations carry contaminants off the paved area and into surrounding soils. Surface water flowing from the site may carry contaminants, although soils in the ditch were not impacted, according to AeroVironment. Contaminants reportedly infiltrate into soils immediately adjacent to the pavement and may not reach the nearby ditch in measurable quantities.

1.4.11.4 Potential Receptors

Base personnel involved in AGE maintenance are the most direct receptors. If groundwater is or becomes contaminated, base and domestic well users to the west may be potential receptors. If surface water carries contaminants



from the site, downstream users and wildlife may be potential receptors.

- 1.4.12 SITE 12: ENTOMOLOGY BUILDING 440
- 1.4.12.1 Site Setting and Location

The site consists of a mixing area adjacent to the southeast corner of Building 440 and a low-lying area 50 feet east of the southeast corner of the building. This building was used for storing and mixing chemicals used for pest control from 1965 to 1980 (Engineering Science, 1984). The soils around the buildings are relatively impervious clay, thus vertical migration is unlikely. The building is currently used by the base as an animal pound.

1.4.12.2 Waste Sources, Types, and Concentrations

Rinsate and spillage from storing and mixing pest control chemicals are the waste sources at this site. Waste types include herbicides and pesticides. No significant contamination was found in any of the soil samples taken at the site, nor was there any visual evidence or odor to indicate contamination problems. No further action is being taken at this site.

1.4.12.3 Migration Pathways

AeroVironment found no contamination at significant levels in soil samples collected. Because many herbicides and pesticides are stable and do not readily degrade, it is probable that contaminants were never present in the area sampled. Therefore, discussions of migration pathways is not applicable.

1.4.12.4 Potential Receptors

Because no contaminants were detected at Site 12, discussion of potential receptors is not applicable.

- 1.4.13 SITE 13: LANDFILL NO. 1
- 1.4.13.1 Site Setting and Location

Landfill No. 1 is on 4 acres in the southwestern sector of the base. It is west of the sludge dewatering beds at the sewage treatment plant and about 100 feet north of Hutchinson Creek. The Photo Wastewater Treatment Plant, the pipeline leading to abandoned Injection Wells Nos. 2 and 3, and the Sanitary Treatment Plant Grease Pit are immediately adjacent to Landfill No. 1. Refuse was received here in the 1940s, but its source and composition are unknown. The site is no longer used, but subsidence typical of landfill aging has occurred in the northeast corner of the landfill. This may be due to abandoned pits used for disposal of sanitary treatment plant grease skimmings. Site 13 is shown in Figure 1-17.

1.4.13.2 Waste Sources, Types, and Concentrations

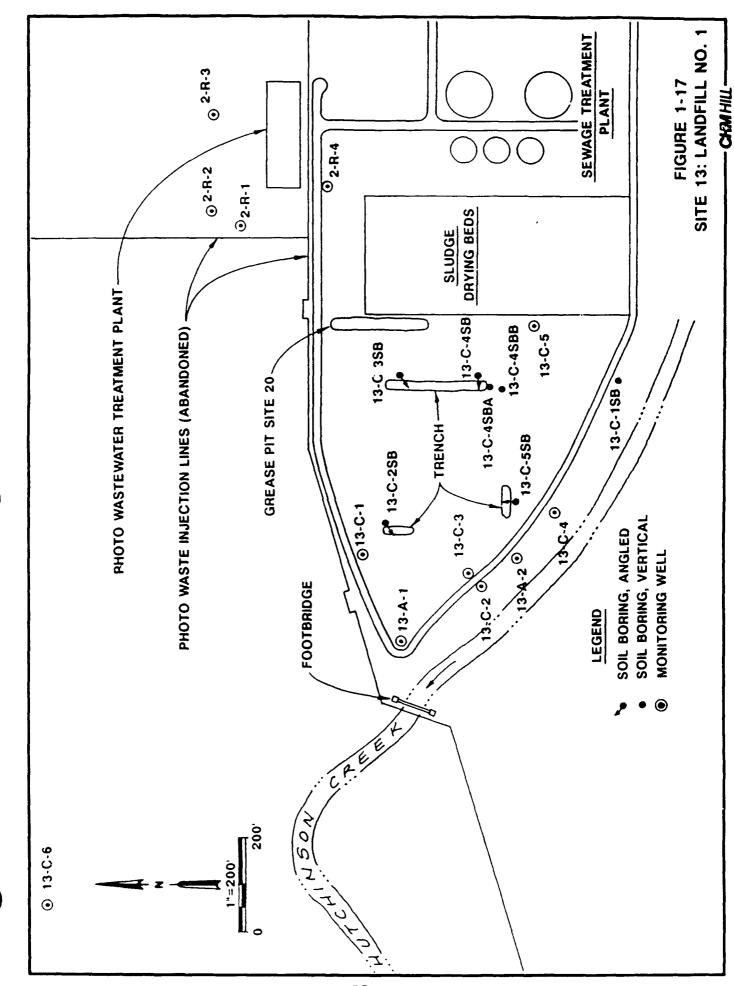
Unknown sources and types of refuse compose the wastes at this site. TCE concentrations in groundwater samples collected during Phase II, Stage 1, measured 0.4 to 106 ug/1 (ppb), and perchloroethylene (PCE) concentrations measured 3.7 ug/1 (ppb). AeroVironment reported that no contamination was detected in sediment from Hutchinson Creek, but pesticides from an unknown source were found in its surface water both upstream and downstream of the landfill. No significant levels of volatile organic compounds (VOCs) were evident in the creek.

1.4.13.3 Migration Pathways

Wastes deposited in the landfill may have included liquids which could migrate through subsurface soils to groundwater. Leachate may also be generated and transported by percolating rainwater. AeroVironment determined that groundwater contained solvent compounds but it is unknown if these originated from the landfill or from other nearby sources. Pesticides detected in the nearby stream water (Hutchinson Creek) are believed to be from another source. Landfill gas may also be generated within the landfill and may migrate into surrounding soils, especially in coarse-grained soil.

1.4.13.4 Potential Receptors

If groundwater impacts affect the water quality at off base private wells, neighboring residents and their stock and crops could potentially be exposed. Because the landfill is inactive and covered, there are no potential receptors on base, unless the still lover is disturbed. Surface water contaminants detected by AeroVironment are believed to originate at sources other than Landfill No. 1 because they were found both upstream and downstream of the landfill.



1-55

1.4.14 SITE 14: TRANSFORMER DRAINAGE PIT

1.4.14.1 Site Setting and Location

The transformer oil drainage pit is in a diked area adjacent to 34th Street, near B Street. From 1977 to 1979, transformers were drained here before being taken to the shop for repair. Soils contain a clay layer. Some localized vegetation impact may have occurred as evidenced by two small non-vegetated areas. Site 14 is shown in Figure 1-18.

1.4.14.2 Waste Sources, Types, and Concentrations

Drainage of transformers has been the source of waste. Waste types are transformer oils contaminated with PCBs. In one soil sample taken from an unvegetated area during Phase II, Stage 1 activities, oil and grease concentrations were 38,000 mg/kg (ppm) and PCB Arochlor 1260 measured 5.3 mg/kg (ppm). In another sample in the same area, oil and grease concentrations were 1,900 mg/kg (ppm) but no PCBs were detected. No contamination was found in the other 10 sample locations, indicating localized contamination.

1.4.14.3 Migration Pathways

Contaminants in the form of oils containing PCBs were discharged directly to surface soils. These contaminants are not considered to be very mobile in the environment and probably remained in the upper portions of the soils. Most of the pit surface is covered by vegetation, limiting the potential for fugitive dust. The berm surrounding the pit prevented surface water discharge from the site. In 1990, some contaminated soil was excavated and taken to the Beale AFB soil holding area. The berms around the site were also removed.

1.4.14.4 Potential Receptors

Beale personnel and persons from the Beale mobile home camping facility 700 feet away could gain access to the site, which is not fenced, and contact surface soils.

1.4.15 SITE 15: LANDFILL NO. 3

1.4.15.1 Site Setting and Location

Landfill No. 3 occupies a 40-acre site east of Landfill No. 2, on 6th Street. It has operated since 1981 and currently accepts domestic garbage and refuse. The Regional

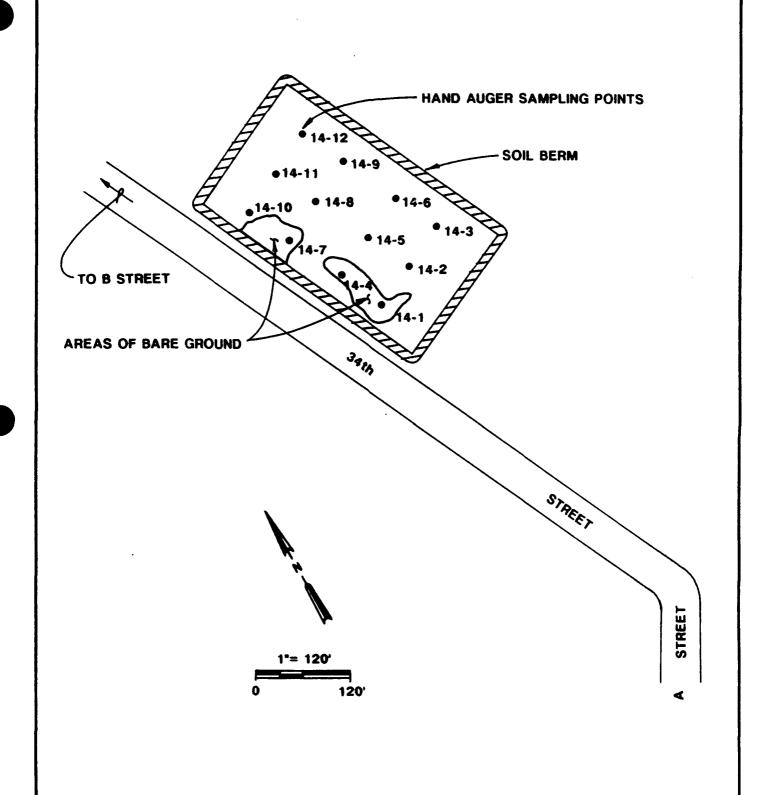


FIGURE 1-18
SITE 14: TRANSFORMER DRAINAGE PIT

SOURCE: AeroVironment, 1987

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Water Quality Control Board has permitted Landfill No. 3 as a Class III landfill.

The trench method is used for waste disposal at Landfill No. 3. Management practices include no chemical waste disposal, run-on and run-off control, and covering of waste daily. Soils are relatively impervious. Site 15 is shown in Figure 1-19.

1.4.15.2 Waste Sources, Types, and Concentrations

Domestic garbage and refuse are the main sources and types of wastes at this site. No groundwater contamination was detected by AeroVironment during Phase II, Stage 1.

1.4.15.3 Migration Pathways

Although no hazardous wastes are believed to have been deposited in this landfill, leachate may still be generated by percolating rainfall. Run-on and run-off controls help minimize leachate generation potential.

Leachate, if generated, may percolate through subsurface soils to groundwater. No groundwater contamination has been detected in existing wells.

Landfill gas may also be generated within the landfill and may migrate into surrounding soils, especially in coarsegrained soil.

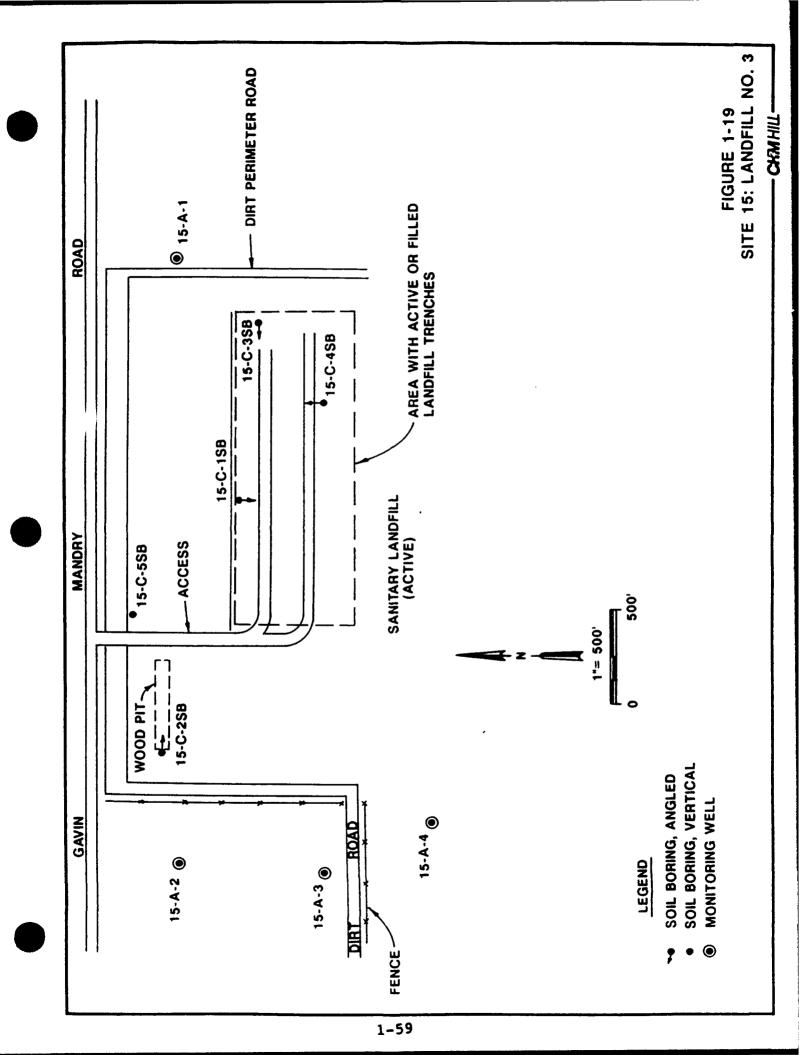
1.4.15.4 Potential Receptors

Base personnel operating the landfill are potential receptors, primarily by exposure to landfill gas. If groundwater is or becomes contaminated, domestic well users to the west are potential receptors. These wells are at least 4½ miles downgradient.

1.4.16 SITE 16: EXPLOSIVE ORDNANCE DISPOSAL AREA

1.4.16.1 Site Setting and Location

The Explosive Ordnance Disposal (EOD) area is in a remote area off a series of dirt roads in the northern sector of the base. The EOD area consists of two bunkers for burning ordnance and a trench that measures approximately 70 feet by 15 feet by 10 feet deep. Unused ordnance (active munitions and explosives, flares, and pyrotechnics) from military bases around Sacramento are detonated in the bunkers or in



the open field. Site 16 is shown in Figure 1-20. A draft RCRA Part B permit for the EOD was completed in 1990.

Diesel fuel and an underlying/overlying layer of wood are used to burn the smaller ordnance. No residual fuel remains after the fire burns itself out. After burning, remains are inspected and unburned ammunition is removed. The burned portion of the ordnance, primarily metal casings, is then disposed in the trench.

During precipitation, the disposal trench fills with water. The standing water provides a hydraulic head which would help move any contaminants in the trench down toward groundwater. Although surface soil consists of clay, the trench depth suggests this soil may have been breached.

1.4.16.2 Waste Sources, Types, and Concentrations

Munitions, explosives, flares, and pyrotechnics are the sources of waste at this site. Waste types include metals and explosive compounds. In the site soils sampled during Phase II, Stage 1, lead concentration was 14,000 mg/kg (ppm), chromium (total) was 2,000 mg/kg (ppm), and barium was 1,500 mg/kg (ppm).

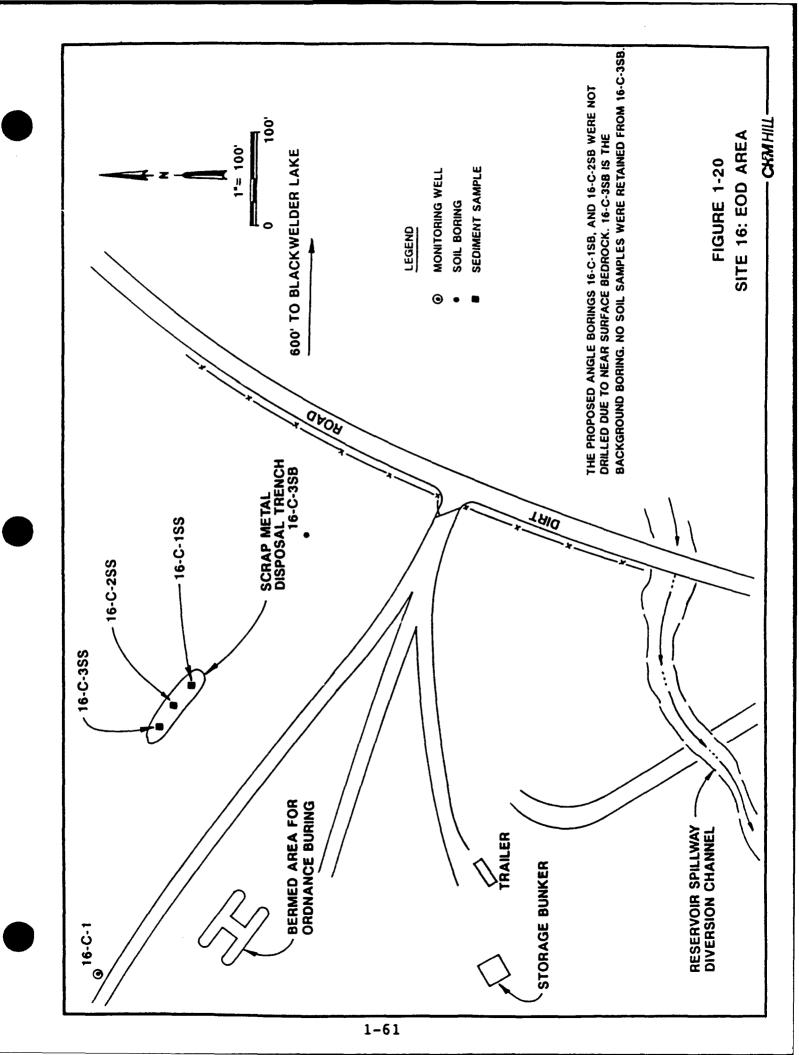
1.4.16.3 Migration Pathways

Lead and chromium present in waste materials and detected in the pit-bottom soil samples are not very mobile through soils. However, little surface soil exists at Site 16 and metals have a lower attenuation in bedrock. Other potential contaminants, such as nitrogen compounds from explosive materials, may be more mobile and may have resulted in deeper impacts. No analyses were conducted for nitrogen species during Phase II, Stage 1.

Because no wells were installed during previous investigations, it was unknown if groundwater had been impacted at this site.

1.4.16.4 Potential Receptors

Base personnel conducting ordnance disposal operations are potential receptors due to contact with site surface soils. The site is remote from other base operations and access is limited. If groundwater is or becomes contaminated, discharge of contaminants to surface water via a spring located west of the site may occur. Should this occur, wildlife and livestock may be potential receptors.



1.4.17 SITE 17: BEST SLOUGH

1.4.17.1 Site Setting and Location

Best Slough flows from east to west on the base before joining Bear River. The site, just south of Sixth Street and east of Landfill No. 3, was added to the IRP investigation because old empty drums were discovered in a 50- to 100-foot trench 50 feet west of the creek in January 1985. The site consists of four depressions, one of which contains approximately 25 empty drums. The drums were rusted and deteriorated. No information is available on what, if anything, the drums contained when they were dumped. Site 17 is shown in Figure 1-21.

1.4.17.2 Waste Sources, Types, and Concentrations

The source of waste at this site would have been the contents (if any) of the drums disposed there. Waste types are not known. Soil and surface water samples analyzed during the IRP Phase II, Stage 1 work did not show any contamination. Further, there were no odors, soil staining, or evidence of chemicals in or near the drums.

1.4.17.3 Migration Pathways

No contaminants were detected at this site. Either the drums discovered in the area were empty when disposed, or contaminants have been transported away or degraded. It is most likely that no contaminant source was present (i.e., drums were empty).

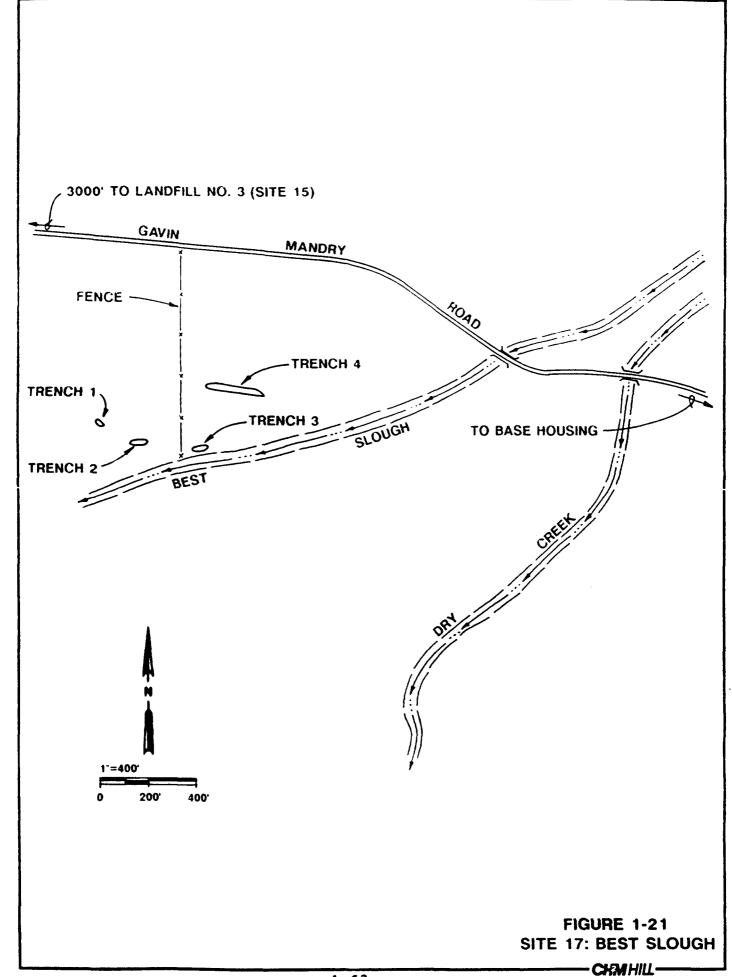
1.4.17.4 Potential Receptors

Because no contaminants were detected at Site 17, a discussion of potential receptors is not warranted.

1.4.18 SITE 18: BULK FUEL STORAGE FACILITY

1.4.18.1 Site Setting and Location

The bulk fuel storage facility, consisting of diked, above-ground storage tanks, is on the northeast side of the intersection of 6th and J Streets. It has operated since 1958. Fuels are delivered to and from the above ground tanks by pipeline, train, or truck. Fuels include jet fuel (AVGAS: JP-4, JP-7, and JPTS), diesel fuel, motor gasoline (MOGAS), unleaded gasoline, and No. 2 fuel oil. No major spills have



been reported, but the site was evaluated because a number of minor spills have occurred while unloading rail cars. Site 18 is shown in Figure 1-22.

1.4.18.2 Waste Sources, Types, and Concentrations

Fuel loading and unloading activities, spills, and leaks are the waste sources here. Waste types are jet fuel, diesel fuel, motor gasoline, unleaded gasoline, and No. 2 fuel oil. Oil and grease concentrations were detected at 300 to 400 mg/kg (ppm) in surface soil samples collected in the drainage ditch by AeroVironment.

1.4.18.3 Migration Pathways

Fuel spills at unloading areas and within tank berm areas have occurred, and localized soil contamination probably exists. It is unknown how many areas have soil contamination or if contaminants migrated vertically through the soils to groundwater. Losses of hydrocarbons from other sources (pipeline leaks, tank bottom leaks) are often difficult to detect and locate. If such leaks have occurred, contaminants may have migrated vertically to groundwater.

If spills occurred within berm areas, water accumulating within the berms due to rainfall may become contaminated. Water accumulating in bermed areas is drained to surface water ditches or pumped onto flat soil areas. If major spills or tank leaks have occurred, subsurface hydrocarbon vapors may be present.

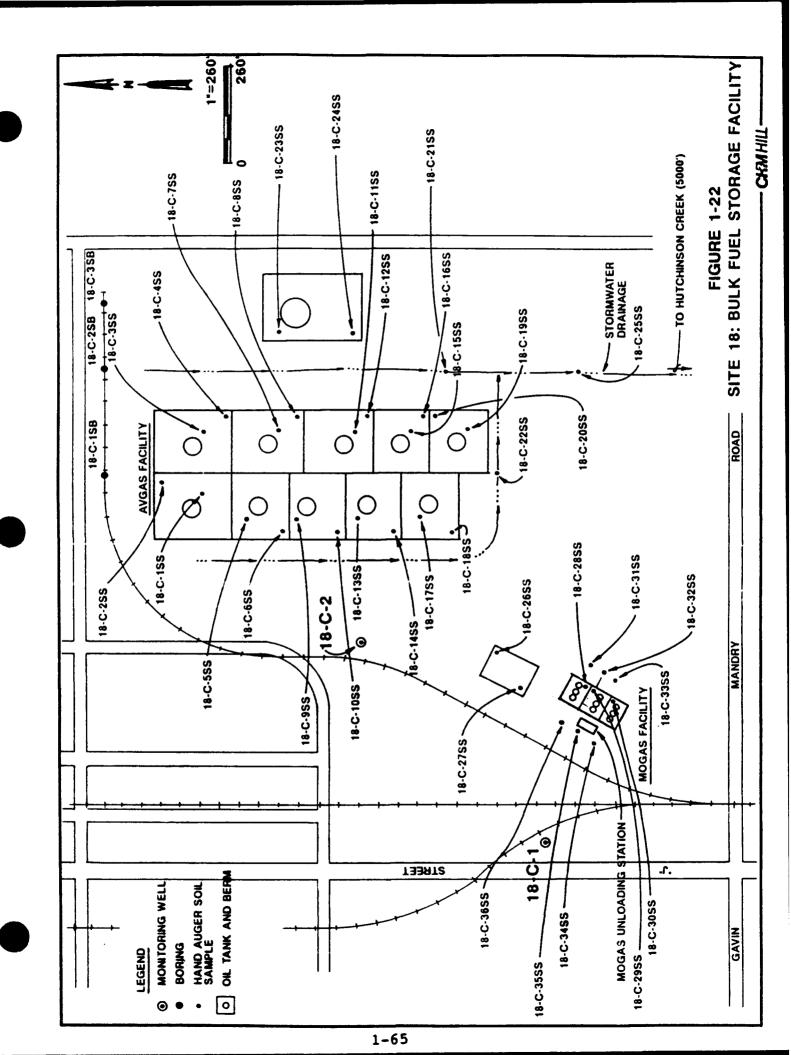
1.4.18.4 Potential Receptors

Base personnel operating the fuel storage and management facilities are potential receptors. If contaminants move or have moved into groundwater, base and domestic well users to the west may be potential receptors. If contaminants are allowed to flow out of the bermed areas, surface waters on base may receive contaminants. Stormwater drains to Hutchinson Creek 5,000 feet south of Site 18. Wildlife and downstream users may be potential receptors.

1.4.19 SITE 19: PHOTO WASTE EMERGENCY HOLDING BASIN

1.4.19.1 Site Setting and Location

The photo waste emergency holding basin is directly across B Street from the base photographic laboratory (see Figure 1-23). It was used intermittently to contain



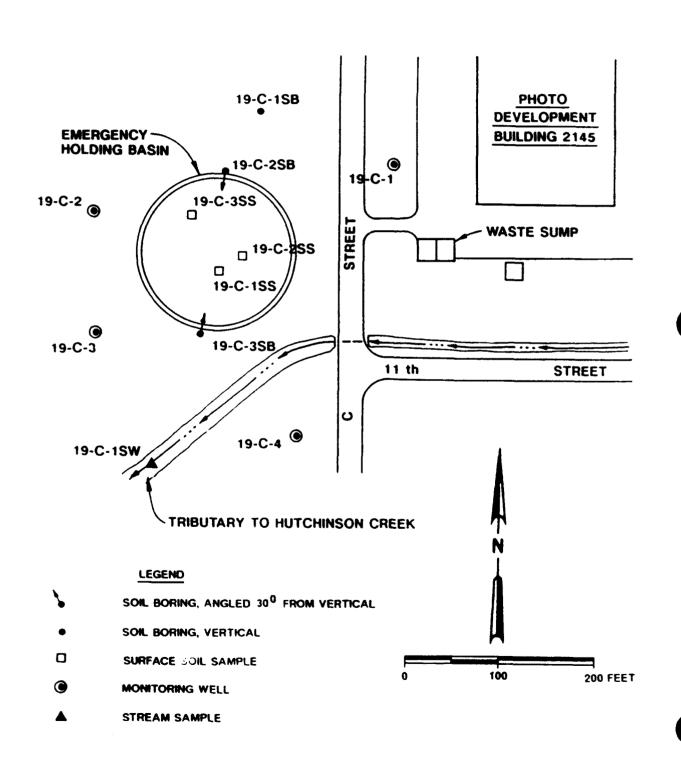


FIGURE 1-23
SITE 19: EMERGENCY HOLDING BASIN

- CHEMI HILL -

photograph: laboratory discharges which were diverted from a concrete wet well during overflow conditions. The concrete wet well is used to hold laboratory discharges prior to their treatment at the photo wastewater treatment plant. The emergency holding basin has concrete sides, a compacted clay bottom, and is fenced. It is currently not in use. The photographic laboratory now has a closed loop water system and no longer discharges to the PWTP (Site 2).

1.4.19.2 Waste Sources, Types, and Concentrations

Wastewater discharges from the photo lab, which until 1986 included pentachlorophenol (PCP) addition for effluent treatment, are the sources here. Waste types include photoprocessing wastes containing metals and residual PCP. Photo waste constituents are listed in Table 1-6 (Section 1.4.2). Basin soils were sampled by the RWQCB in 1987 and reported to contain hazardous levels of PCP. No ground-water sampling has been conducted at this site and no IRP activities were conducted prior to the Stage 2-1 investigation.

1.4.19.3 Migration Pathways

Because the emergency holding basin has a compacted clay bottom and concrete sides, and contained waste materials only intermittently, the likelihood for vertical migration is low. Surface clays may contain some contaminants, and organic compounds may have migrated partially or totally through the clay liner. If contaminants have penetrated the clay bottom, vertical migration toward groundwater may occur. Surface water is not considered to be a migration pathway because the emergency holding basin has never overflowed.

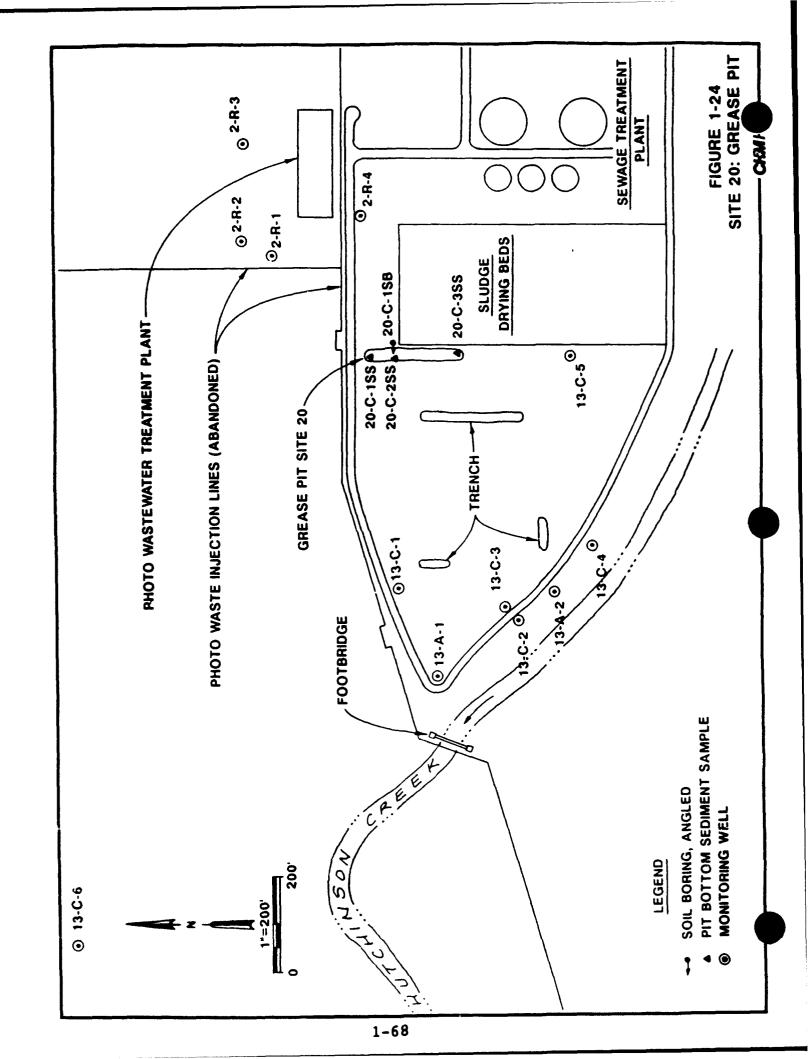
1.4.19.4 Potential Receptors

The emergency holding basin at Site 19 is fenced and, therefore, base personnel exposure to surface soils is minimized. If groundwater is or becomes contaminated, domestic well users to the west may be potential receptors. These wells are at least 2 miles from Site 19.

1.4.20 SITE 20: GREASE PIT (SANITARY TREATMENT PLANT)

1.4.20.1 Site Setting and Location

The grease pit is an unlined excavation located northwest of the sewage treatment plant (see Figure 1-24). It is used to dispose of sewage plant clarifier skimmings. The pit



contains a liquid material with a foamy, greasy substance on the surface.

1.4.20.2 Waste Sources, Types, and Concentrations

Grease skimmings from the sewage treatment plant are the principal waste sources here. Pit fluid samples collected and analyzed by the RWQCB detected toluene at $1.8\ mg/l$ (ppm), oil and grease at $6,800\ mg/l$ (ppm), and total petroleum hydrocarbons at $15\ mg/l$ (ppm). An area of subsidence located west of the active grease pit may be the location of a previous pit which has been backfilled.

1.4.20.3 Migration Pathways

Because the pit is unlined and contains fluid, the primary migration pathway is vertical migration through soils, and eventually to groundwater.

1.4.20.4 Potential Receptors

The grease pit site is just east of Landfill No. 1, where groundwater wells have indicated groundwater is contaminated with TCE. If groundwater contamination affects the quality of groundwater in the area, down gradient off base private wells (west of the base boundary) could potentially be affected. Potential receptors thus include neighboring residents and their crops and livestock. Base personnel could also be potential receptors if they were in direct contact with grease pit wastes.

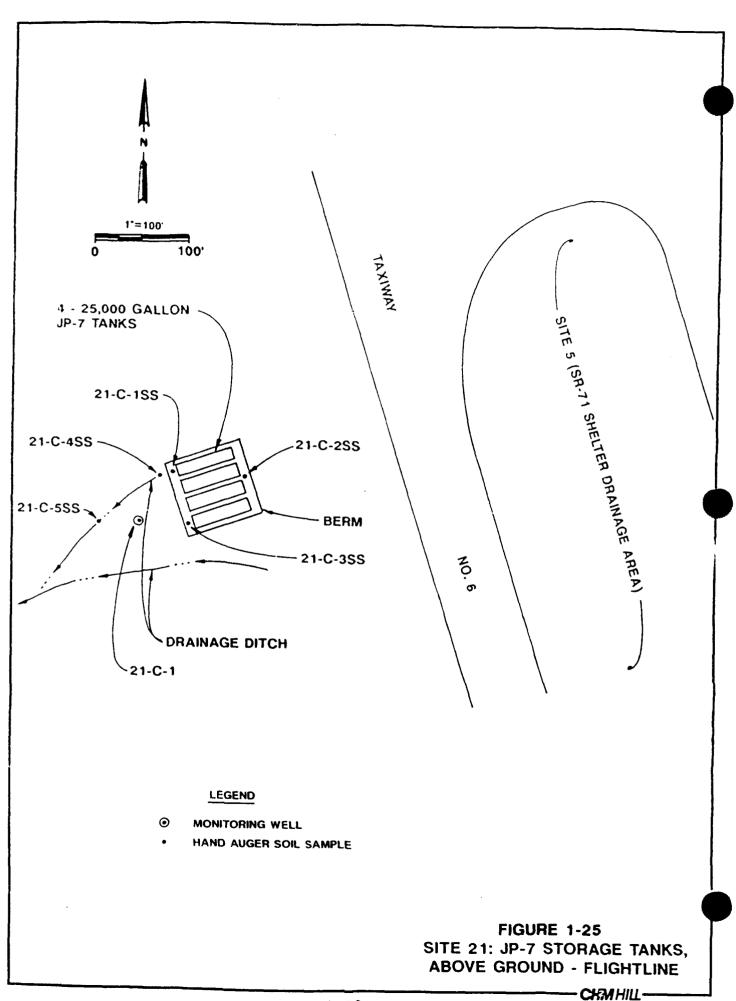
1.4.21 SITE 21: JP-7 ABOVE GROUND FUEL STORAGE TANKS ON THE FLIGHTLINE

1.4.21.1 Site Setting and Location

The JP-7 above ground storage tanks are located between taxiway No. 6 and the main runway, west of Site 5, the SR-71 Shelter Drainage Area (see Figure 1-25). A bermed area, approximately 80 feet square, contains four 25,000-gallon above ground tanks. Stormwater accumulated within the bermed area is allowed to flow into a small ditch, which discharges to the field west of the tanks.

No previous IRP activities have been conducted at Site 21.

Many active underground fuel tanks and pipelines exist in the flightline area but are not included in current IRP activities.



1.4.21.2 Waste Sources, Types, and Concentrations

The primary waste source is the accidental release of hydrocarbon fuels due to spillage or leaks. Waste type is limited to JP-7 jet fuel.

1.4.21.3 Migration Pathways

Fuels spilled in the berm area would soak into soils and, if enough fuel is lost, migration to groundwater would be possible. Migration of soluble components of the fuels may occur with infiltrating stormwater. Fuels entrained in stormwater could be discharged to the drainage ditch and nearby soils.

1.4.21.4 Potential Receptors

If significant fuel losses have occurred, groundwater quality may be impacted. The site is upgradient from both base and private water wells. Therefore, if groundwater has been contaminated, base personnel may ingest contaminated water, and persons, livestock, and crops off base may also be potential receptors. Base personnel working in the area may also be exposed to contaminated surface soils.

1.4.22 SITE 22: ABANDONED UNDERGROUND STORAGE TANKS

1.4.22.1 Site Setting and Location

There were approximately 750 underground storage tanks in the area of the base previously occupied by Camp Beale, a World War II Army base. These tanks stored fuel oil and gasoline. It is not known whether they were emptied, removed, or abandoned in place when the Army closed the camp.

A review of 1943 maps of Camp Beale showed the following tanks:

Gasoline Tanks

30	-	12,000 gallons	= =	360,000 gallons
6	-	10,000 gallons		60,000 gallons
_2	-	5,500 gallons		11,000 gallons
38				431,000 gallons

Fuel Oil Tanks

176	-	264	gallons	=	46,464	gallons
10	-	420	gallons	=	4,200	gallons
324	-	580	gallons	=	187,920	gallons
194	-	1,150	gallons	=	223,100	gallons
6	-	1,500	gallons	=	9,000	gallons
1	-	2,200	gallons	=	2,200	gallons
2	-	3,000	gallons	=	6,000	gallons
1	-	10,000	gallons	=	10,000	gallons
<u> </u>	-	12,000	gallons	=	12,000	gallons
715					500,884	gallons

The area which encompasses the abandoned tank locations is shown on Figure 1-6, presented previously, and on Plate 1.

In 1990 Beale AFB removed 21 tanks from the area south of Warren Shingle Boulevard in the vicinity of A to C Streets prior to construction of facilities for the Navigation School. The tanks are believed to have been installed in the 1950s when Camp Beale was converted to Beale AFB. The removed tanks ranged in size from 150 to 10,000 gallons and soil cleanup was achieved when the tanks were removed.

1.4.22.2 Waste Sources, Types, and Concentrations

Underground storage of fuel oil and gasoline is the potential source of contamination at this site. Waste types are fuel oil, gasoline, and their constituents. No sampling has been done to determine concentrations.

1.4.22.3 Migration Pathways

Most of the abandoned underground tanks identified on old drawings were fuel oil tanks used to fire barracks furnaces. Although the buildings are no longer present, the tanks may possibly still exist. It is also possible that the tanks were not pumped dry and/or filled with inert material. The condition of these tanks is unknown, but because of age is probably poor.

The larger gasoline tanks (38) were possibly not properly abandoned either. It is more likely, however, that their contents were removed.

If tanks still exist and contained fuels, leaks probably occurred and soil and groundwater impacts may be present. Impacts may have been reduced due to natural biological degradation.

1.4.22.4 Potential Receptors

Leakage of storage tanks may contribute to soil and groundwater contamination. If groundwater is or becomes contaminated, base and domestic well users to the west of the base may be potential receptors.

1.4.23 SITE 23: NINTH TRANSPORTATION REFUELING/MAINTENANCE SHOP

1.4.23.1 Site Setting and Location

The transportation shop is located east of B Street between Warren Shingle Boulevard and Doolittle Drive. The site was used as a repair shop for fuel tank trucks. The site is mostly paved and has a large repair shop. An oil/water separator is present next to the shop. Site 23 is shown in Figure 1-26. No IRP activities have been conducted prior to Stage 2-1 activities.

1.4.23.2 Waste Sources, Types, and Concentrations

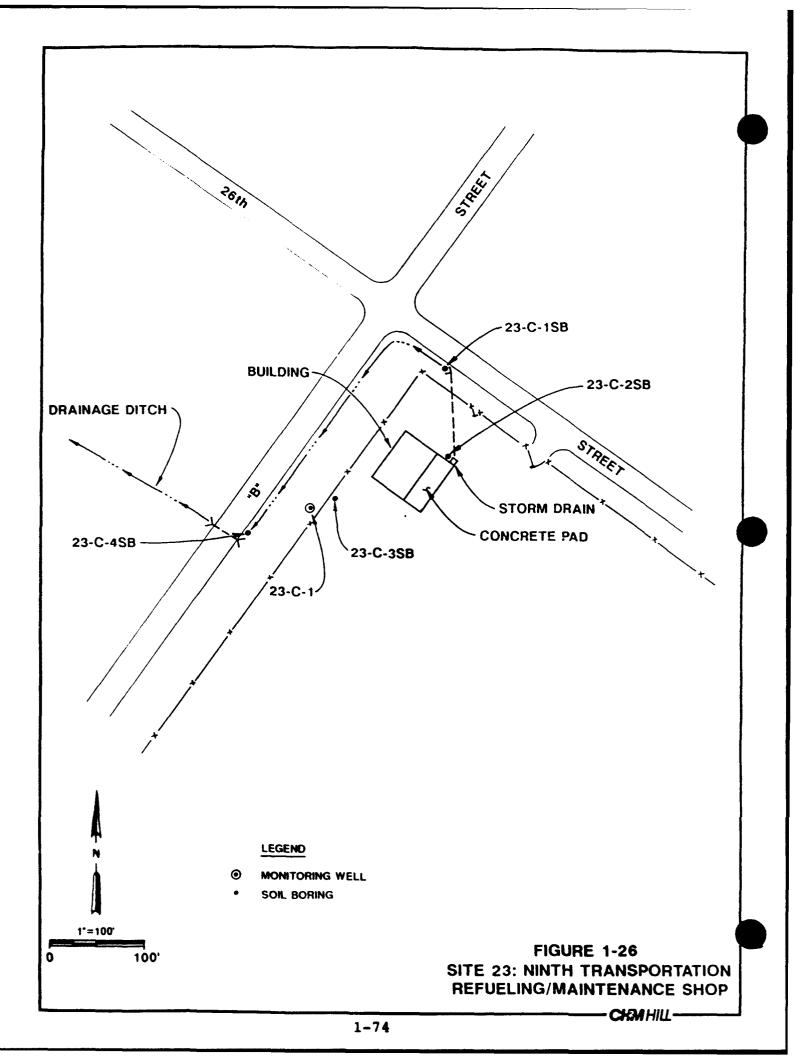
Suspected wastes are oils and fuels which may have leaked from trucks parked onsite. No evaluation of contamination has occurred, but stormwater runoff from the site contains minor amounts of oils and/or fuels.

1.4.23.3 Migration Pathways

Stormwater runoff may carry contaminants off the asphalt area and into soils surrounding the site. If enough contaminants enter the soils and percolate downward, groundwater may be impacted. Contaminants may also be carried by stormwater to surface water bodies on base.

1.4.23.4 Potential Receptors

Base personnel working at the site are potential receptors. If contaminants are transported to surface water bodies, wildlife, livestock, and humans exposed to contaminated surface water are potential receptors. If groundwater is or becomes contaminated, base and off base well users to the west may be potential receptors. The nearest wells are at least $2\frac{1}{2}$ miles from Site 23.



1.4.24 SITE 24: LANDFILL NO. 4

1.4.24.1 Site Setting and Location

Landfill No. 4 is located east of F Street and south of Gavin Mandry Road. The site was a trench and fill operation and was probably active in the 1960s and possibly the 1970s. Site 24 is shown in Figure 1-27. No IRP activities have been conducted at Site 24 prior to Stage 2-1 activities.

1.4.24.2 Waste Sources, Types, and Concentrations

It was believed that Landfill No. 4 was originally intended for demolition debris (construction debris) and other inert, non-hazardous substances. The landfill may have received refuse and trash during later operations. It is unknown if contaminants are present.

1.4.24.3 Migration Pathways

If materials were deposited in the landfill other than inert refuse, contaminated leachate may develop and be transported by percolating storm water. This may cause groundwater contamination. No other migration pathways are believed to be present. The trenches are covered with soil, except for some construction wastes.

1.4.24.4 Potential Receptors

If groundwater is or becomes contaminated, domestic well users to the west may be potential receptors. It is unknown if contamination exists at Site 24.

1.5 SUSPECTED CONTAMINANTS

As stated in previous sections, contamination that may be present at Beale AFB originated from hydrocarbon fuels, solvents, domestic refuse, photo wastewater and sludge, pesticides, herbicides, ordnance disposal, and other releases of hazardous materials and wastes. Contaminants of concern vary among the sites. Table 1-7 presents the waste types and concentrations detected in previous investigations. Table 1-7 does not include results of the current Stage 2-1 investigation, which are presented in Section IV of this report.

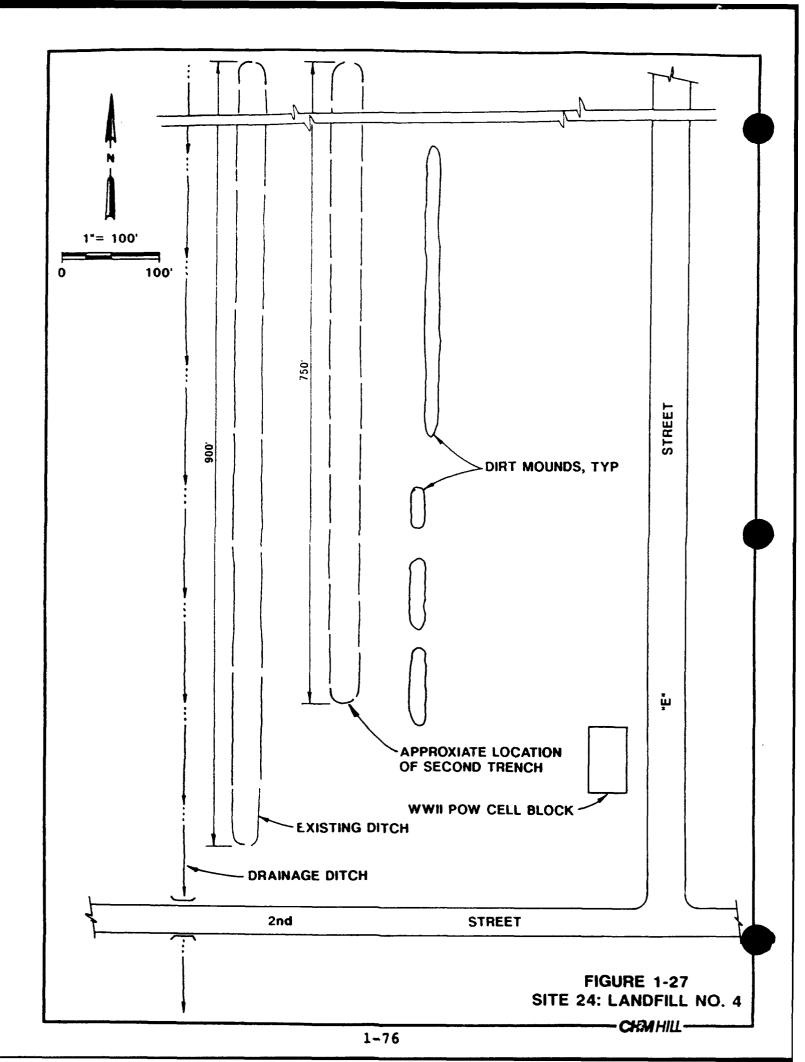


Table 1-7 WASTE TYPES AND CONCENTRATIONS AT BEALF IRP SITES IRP PHASE II, STAGE I SUPEMAR!

Table 1-7 (continued)

Site Description 6. J-57 Test Cell 7. Leadfill No. 1 7. Entreact Cell 8. J-57 Test Cell 8. J-57 Test Cell 9. Entreact Cell 10. J-58 Test Cell 11. Aircraft Ground Equipment 12. Aircraft Ground Equipment 13. Landfill No. 1 14. Transformer Designage Pit 15. Landfill No. 1 16. Transformer Designage Pit 16. Transformer Designage Pit 17. Transformer Ordanace 18. June of the Single and Single Single 18. Transformer Ordanace 19. Explosive O	Maximum Concentrations Detected During Previous Investigations	11: Oil and grease 700 mg/kg Petroleum hydrocarbons 1,400 mg/kg oundwater: No contamination detected	il: Chlordane (one sample) 0.9 mg/kg No recorded chlordane use on the base.	11: Oli and grease 4,000 mg/kg Petroleum hydrocarbons 4,700 mg/kg oundwater: No contamination detected	ils: Oil and grease 7,000 mg/kg oundwater: No contamination detected	ıls: No contamination detected	oundwater: TCE 106 ug/1 PCE 3.7 ug/1 eek: Pesticides detected in creekwater. No contamination detected in creek	grease 38,000 mg/kg or 1260 5.3 mg/kg	oundwater: No contamination detected	14,000 mg/kg 2,000 mg/kg 1,500 mg/kg
B. J-57 Test Cell B. Cravel basin received drainage from periods and herbitales save tested ditch. Cravel basin received drainage from alixed. B. J-58 Test Cell SR-71 alroraft engines rested here. SR-71 alroraft engines rested here. SR-71 alroraft engines rested here. SOLIS are stained in drainage from any or leak oil and hydraulic fillude. Solis are stained in the ditch. Aircraft Ground Equipment Aircraft ground support vehicles are harbed in the ditch received from support vehicles parking lot. Pesticides and herbicides vere and support vehicles and herbicides vere stained in the building. Pesticides and herbicides vere and received from and around the building. Transformer Drainage Pit Phis landfill occupies a 40-acre source and composition of vastes is used. The allor of vastes in the landfill occupies a 40-acre source and composition of vastes in use. Whis landfill No. 3 Transformer Drainage Pit Retusen 1977 and 1979 transformers were drained here before repair. Inhis landfill occupies a 40-acre source and composition of vastes in use. Unused ordnance refuse. Unused ordnances are detonated in this area. Diseal fuel and vood and the area. Diseal fuel and vood are used to burn smaller ordnances. The burned metal portion of the ordnances are placed in a trench.	Maximum C During P	Soil: Oil and gr. Petroleum Groundwater: No contami	Soil: Chlordane No record	Soll: Oil and grease Petroleum hydr. Groundwater: No contaminati	Soils: Oil and grease Groundwater: No contaminati	Soils: No contam	Groundwater: TCE PCE Greek: Pesticides No contami		Groundwater: No contami	Soils: Lead Chromium Barium
9. Entomology Building 2560 (Travel basin received drait pesticides and herbicides mixed. Pesticide containe also rinsed here. 10. J-58 Test Cell SR-71 sircraft engines tes mixed. Pesticide containe also rinsed here. 11. Aircraft Ground Equipment Aircraft ground support verse at a stained direction and articles parking linds. Soils are stained in drain fulleds. Soils are stained in drain. 12. Entomology Building 440 Pesticides and herbicides a stained directive parking linds. Soils are stained in and articles parking linds. In the building. 13. Landfill No. 1 This landfill occupies 4 are received refuse in the 194 source and composition of unknown. The site is no lings. 14. Transformer Drainage Pit Between 1977 and 1979 tran were drained here before received refuse in the site is no lings. 15. Landfill No. 3 Hie landfill occupies a 44 site. It has been in oper in the area. Dissoil fuel and are two bunkers or in an open it this area. Dissoil fuel and are the placed in a in the burned metal portion of The burned fuel burned in a proper of The burned metal portion of The burned fuel part are placed in a proper of The burned metal portion of The area.	Waste Types	Jet fuel Perroleum distillates Soaps	Pesticides Herbicides	Jet fuel Petroleum distillates Soaps Oil Trichloroethylene (TCE)	Oil Hydraulic Fluid Fuel (gasoline)	Pesticides, herbicides	Unknown	Transformer oil PCBs	Domestic garbage and refuse	Detonated munitions, explosives, flares, and pyrotechnics debris
8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Description	rcraft engines were Soils were stained	Gravel basin received drainage from pesticides and herbicides stored and mixed. Pesticide containers are also rinsed here.	SR-71 aircraft engines tested here. Soile are etained in drainage ditch.	Aircraft ground support vehicles are known to leak oil and hydraulic fluids. Soils are stained in the ditch receiving drainage from support vehicles parking lot.	Pesticides and herbicides were stored and mixed in and around the building.	ifill occupies refuse in the composition of the site is not th	Between 1977 and 1979 transformers were drained here before repair.	This landfill occupies a 40-acre site. It has been in operation since 1981 and accepts domestic garbage and refuse.	Unused ordnances are detonated in two bunkers or in an open field in this area. Diesel fuel and wood are used to burn smaller ordnances. The burned metal portion of the ordnances are placed in a trench.
1 - 78	Site	J-57 Teat Cell	Entomology Building 2560	J-58 Test Cell	Aircraft Ground Equipment Maintenance Area	Entomology Building 440	Landfill No. 1	Transformer Drainage Pit		Explosive Ordnance Disposal (EOD) Area
		6	6	10.	± 1-	≟ -78	13.	14.	15.	16.

Table 1-7 (continued)

Maximum Concentrations Detected During Previous Investigations	No contamination detected.	oil: Oil and grease 300-400 mg/kg	Soils: PCP detected in soils (RWQCB) Groundwater: No sampling to date	Pit fluid (RWQCB samples) Toluene Oil and grease foral petroleum hydrocarbons	No sampling to date	No sampling to date	No sampling to date	No sampling to date
Max1.	No con	Soil: 011	Solls: PCP Croundy	Pit fluid Toluene Oil and Total po	No sam	No sam	No sam	No sang
Waste Types	Unknown.	Jet fuel Diesel fuel Motor gasoline Unleaded gasoline No. 2 fuel oil	PCP treated photo wastewater	Oil and grease Organic solvents	Jet fuel	Fuel oil Gasoline	Jet fuel Diesel Oils	Demolition debris Domestic refuse
Description	Empty drums were found in area.	Diked above ground fuel storage tanks.	During overflow conditions photo wastes are diverted to this holding basin with compacted clay bottom and cement sides.	Unlined pit used to dispose sewage plant clarifier skimmings.	Diked aboveground fuel storage tanks.	Old base area maps show 753 abandoned underground storage tanks in the area previously occupied by Camp Beale.	Repair shop and parking area for refueling trucks.	Trench fill 1960s-1970s. Contents unknown.
Site	Best Slough	Bulk Fuel Storage Facility	Photo Waste Emergency Holding Basin	Grease Pit (Sanitary Treatment Plant)	<pre>JP-7 Aboveground Fuel Storage Tanks (Flightline)</pre>	Abandoned Underground Storage Tanks	Ninth Transportation Shop	Landfill No. 4
1	17.	18.	19.	20.	; 1-	∺ 79	23.	24.
					1-	17		

1.6 IDENTIFICATION OF FIELD TEAM

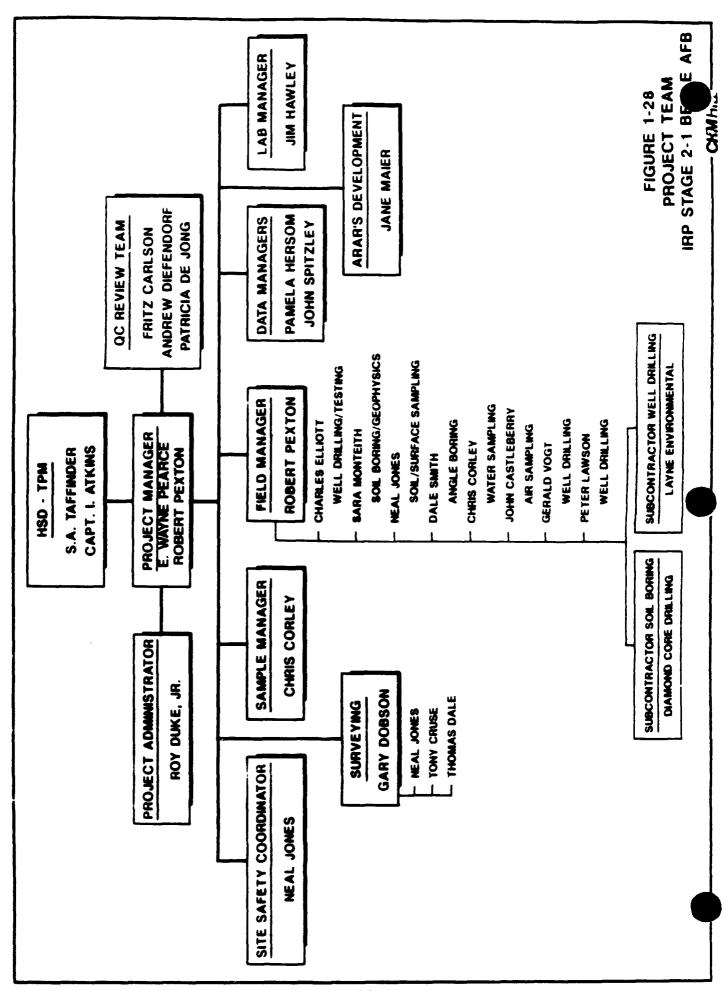
Field team members included CH2M HILL personnel (primarily from the Sacramento and Redding offices). Geophysics activities were directed by a CH2M HILL geophysicist from the Milwaukee, Wisconsin office. Figure 1-28 presents the team members for the project, including field team personnel and subcontractors.

1.7 OTHER PERTINENT INFORMATION

The following abbreviations and acronyms are used in this report.

AA	atomic adsorption
AFB	Air Force Base
AFSC	Air Force Human Systems Division
ARAR	applicable or relevant and appropriate
	requirements
ATSDR	Agency for Toxic Substances and Disease
	Registry
AVGAS	aviation fuel
BETX	benzene, ethylbenzene, toluene, xylene
BGS	below ground surface
CARB	California Air Resources Board
CERCLA	Comprehensive Environmental Response,
	Compensation, and Liability Act
COD	chemical oxygen demand
DCE	dichloroethene
DHS	Department of Health Services (California)
DO	dissolved oxygen
DOD	Department of Defence
DQ0s	data quality objectives
EOD	explosive ordnance disposal area
EHB	emergency holding basin
EPA	Environmental Protection Agency
FPTA	fire protection training area
GC	gas chromatograph
GC/MS	gas chromatograph mass spectrometer
HAR	Hydrogeologic Assessment Report
ICP	inductively coupled plasma emission
	spectrometer
IRP	Installation Restoration Program
LOQ	limit of quantification
MCL	maximum contaminant level
mg/kg	milligrams per kilogram (ppm)
mg/1	milligrams per liter (ppm)
MOGAS	motor gasoline
MTV	mobility, toxicity, or volume

mybp million years before the present NCP National Contingency Plans NGVD National Geodetic Vertical Datum OEHL Occupational and Environmental Health Laboratory OVA organic vapor analyzer **PARCC** precision, accuracy, representativeness, completeness, comparability **PVC** polyvinyl chloride ppb parts per billion ppbv parts per billion by volume ppm parts per million PWTP photo wastewater treatment plant QAPP quality assurance project plans quality assurance/quality control QA/QC remedial action plan RAP RI remedial investigation RI/FS remedial investigation/feasibility study RPD relative percent difference RTC relative toxicity concentration RWOCB Regional Water Quality Control Board (California) SAC Strategic Air Command SAL state action level SARA Superfund Amendments and Reauthorization SCS Soil Conservation Survey SDWA Safe Drinking Water Act **SWAT** Solid Waste Assessment Test SWRCB State Water Resources Control Board (California) STLC soluble threshold limit concentration TCE trichloroethylene TDS total dissolved solids TEF toxicity equivalency factor TFH total fuel hydrocarbons TPCA Toxic Pits Cleanup Act TTLC total threshold limit concentration TSP total suspended particulate ug/1micrograms per liter (ppb) USAF United States Air Force VOC volatile organic compound WET waste extraction test



II. ENVIRONMENTAL SETTING

Information included in this section has been summarized from several previous reports, existing literature, and current IRP Stage 2-1 activities. A reference list is provided in Appendix C. These references contain more detailed descriptions of environmental setting than are presented in this section.

2.1 GEOGRAPHIC SETTING

Beale Air Force Base is approximately 40 miles north of the City of Sacramento in the eastern part of the Sacramento Valley. The Sacramento Valley together with San Joaquin Valley to the south constitutes the Great Valley of California (Figure 2-1). Extending from Redding in the north to Bakersfield in the south, this valley is about 60 miles wide, bordered to the east by Sierra Nevada Foothills and to the west by the Coast Ranges.

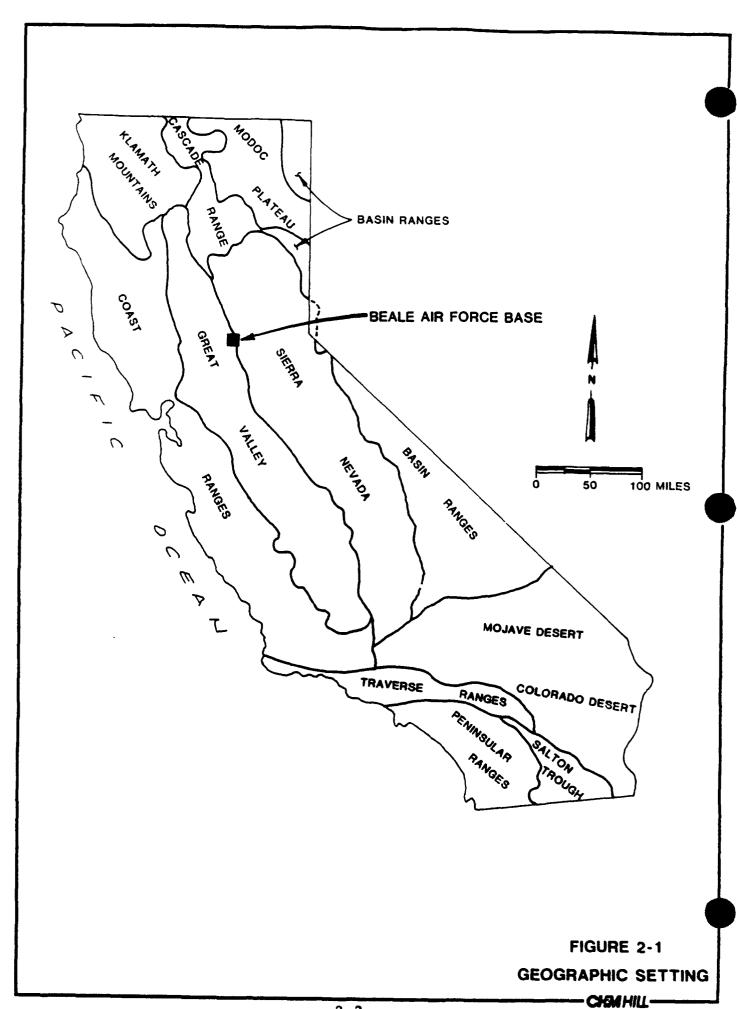
2.1.1 PHYSIOGRAPHY (PHYSICAL GEOGRAPHY)

The elevation of Beale AFB ranges from 80 to 90 feet above the National Geodetic Vertical Datum of 1929 (NGVD) along the western and southwestern boundary, to more than 400 feet in the northeastern part of the base. The rise in elevation occurs along gently sloping hills common to the Sierra Nevada Foothills, which rise gradually to over 9,000 feet NGVD at the Sierra Nevada crests directly east of Beale AFB.

The Sacramento River drains the Sacramento Valley. It flows southerly to the Sacramento-San Joaquin Delta, and discharges through San Francisco Bay into the Pacific Ocean. The Feather River flows southward west of the base to a confluence with the Sacramento River just north of Sacramento. Both the Yuba River to the north of Beale Air Force Base and the Bear River to the south drain from east to west into the Feather River. Several small creeks flow from east to west across the base and are confluent with either the Bear River or the Feather River south of the base.

2.1.2 CULTURAL GEOGRAPHY

This section on cultural geography discusses land use, demography, population density, age distribution, family income, education level, socioeconomics, and public health and welfare at Beale AFB and in the surrounding area.



2-2

2.1.2.1 Land Use

Beale Air Force Base is entirely within Yuba County. The Yuba County General Plan indicates that the primary land use around the base is agriculture, with 85 percent zoned Agriculture, Recreation, Timber Preserve, Forest Service, or Bureau of Land Management (Yuba County Planning Department, 1986). The major crops grown around Beale AFB are peaches, prunes, pears, walnuts, grain, rice, almonds, and alfalfa. Cultivation of the diverse range of agricultural products has been made possible by extensive and intensive irrigation. A pictorial representation of land use outside the base is given in Figure 2-2. A breakdown of the existing zoning is presented in Table 2-1.

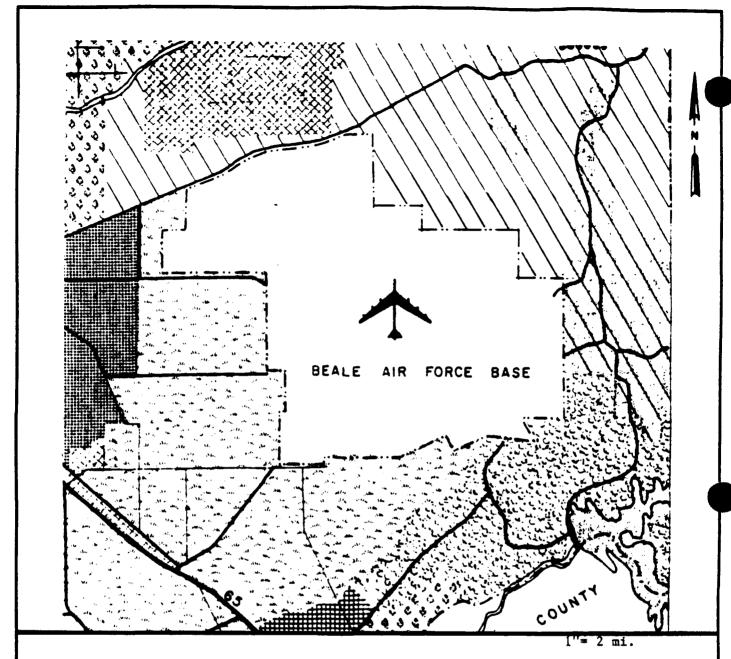
Table 2-1 EXISTING ZONING FOR YUBA COUNTY

Category	Total Acreage (Approximate)
Agriculture	222,710
Residential	7,270
Commercial	500
Industrial	9,200
Recreation	25,680
Timber Preserve	27,470
Planning Reserve	870
Flood Plain	¹
Public Facilities	⊸ −³
Airport	
Total Zoned Acres	293,630
Proposed Marysville Dam	21,000
Beale Air Force Base	22,944
U.S. Forest Service, BLM	72,000
Total Acres	409,574

'Overlay Zones

Source: Yuba County Planning Department, 1986

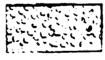
Beale AFB itself comprises 22,944 acres: 1,471 acres of improved grounds; 2,619 acres of semi-improved grounds; and



LAND USE



OPEN SPACE RECREATION



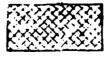
SECONDARY AGRICULTURE (10-20 ac./ dwelling)



PLANNING RESERVE (20 yrs)



PRIMARY AGRICULTURE (80-160 ac./ dwelling)



INDUSTRIAL



EXCLUSIVE AGRICULTURE (40-80 ac./dwelling)



PLANNING RESERVE (10 yrs.)

FIGURE 2-2 LAND USE

CHEM HILL-

SOURCE: LAND USE ELEMENT YUBA COUNTY GENERAL PLAN

18,250 acres of unimproved grounds. Land under facilities (e.g., buildings, parking lots, paved areas, roads) totals 604 acres.

2.1.2.2 Demography

As indicated in Table 2-2, the 1985 population of Yuba County, including Beale AFB, was approximately 53,300. The population of Beale AFB varies between 5,000 and 8,000, and is currently about 6,000 persons.

Table 2-2 YUBA COUNTY POPULATION

<u>Year</u>	<u>Population</u>
1970°	44,736
1975 ^b	44,952
1980*	49,733
1985°	53,296

^{&#}x27;U.S. Bureau of Census '1975 Special Census

Source: Yuba County Planning Department, 1986

2.1.2.3 Population Density

In 1975, a Special Census was conducted throughout Yuba County. According to the census, 25,495 people (57 percent) resided within the urbanized areas of Marysville, Linda, and Olivehurst. The location of these urbanized areas with respect to Beale AFB is illustrated in Figure 1-5, given previously. Approximately 11 percent of the population were located in the foothill and mountainous communities of the County. Population information for Yuba County communities in 1975 is presented in Table 2-3.

2.1.2.4 Age Distribution

The 1975 Special Census indicates that persons aged 20 to 59 years make up the greatest portion of the county's population at 49.9 percent. However, in recent years, senior citizens and retired persons have been attracted to Yuba County because of the quiet, uncrowded atmosphere. The

State Department of Finance

Table 2POPULATION - 1975 SPECIAL CENSUS

Community	<u>Population</u>
Marysville	9,254
Linda	8,859
Beale Air Force Base	8,208
Olivehurst	7,382
Wheatland	1,365
Loma Rica	916
Brownsville	728
Oregon House	698
Browns Valley	601
Dobbins	469
Camptonville	443
Challenge	236
Smartville	200
Rackerby	200
Strawberry Valley	<u>156</u>
Total	44,952

Source: Yuba County Planning Department, 1986

Special Census indicates that over 10 percent of the population in Yuba County in 1975 were 60 years old or older (Yuba County Planning Department, 1986).

2.1.2.5 Family Income

The per capita personal income in Yuba County has historically been lower than the state as a whole. The primary reasons are seasonal employment in the agricultural industry and lower than average wages. Table 2-4 shows that approximately 70 percent of the households earned less than \$10,000 per year and only 2 percent earned more than \$35,000 in 1975. More recent information on wages is not available at this time.

2.1.2.6 Education Level

Information on education levels in Yuba County is not available at this time. Air Force personnel are required to have a high school education or general education diploma.

Table 2-4
INCOME DISTRIBUTION BY HOUSEHOLDS
(Unincorporated Areas)

Income	Number	Percent
\$ 0 - \$ 5,999 per year	3,666	36
\$ 6,000 - \$ 9,999 per year	3,345	33
\$10,000 - \$14,999 per year	1,953	19
\$15,000 - \$19,999 per year	883	9
\$20,000 - \$34,999 per year	384	4
\$35,000 and over	114	2

Source: 1975 Special Census, Yuba County Planning Department, 1986

2.1.2.7 Socioeconomic

The most dominant economic force in Yuba County is agriculture, but only a small portion of the labor force is in the agricultural industry. Employment figures are compiled on a bi-county basis for Yuba and Sutter counties. The unemployment rate for Yuba-Sutter area in 1980 was 12.5 percent.

According to the information compiled by the California Employment Development Department, public service employees are the largest group in the labor force in this region.

Beale AFB has a significant economic impact on the region's communities. For fiscal year 1987, the Air Force and the Oak Ridge National Laboratory estimate that of the total economic impact of \$427.6 million, \$206.3 million stayed in the local area through payrolls, service and construction contracts with local businesses, and school impact funds. In addition to the 5,835 employees paid directly by the Air Force, an estimated 4,555 secondary jobs are created by the initial expenditure of Air Force funds and the subsequent secondary and tertiary expenditure of those funds between local businesses.

Under Public Law 81-874, Impact Aid, financial assistance is provided to local schools based on the number of students who are dependents of parents employed on federal property. During the school year 1985-1986, \$1.6 million or 99 percent of the total federal funds received by local schools were the result of Beale students in the public school system.

2.1.2.8 Public Health and Welfare

Health care services in Yuba County are provided by one general hospital, Rideout Memorial Hospital; one emergency center, Rideout Emergency Center; two health clinics, Yuba General Medical Clinic and Yuba Feather Health Center; one convalescent hospital, Marysville Convalescent Hospital; one rest home, Feather River Manor; and two senior citizen housing developments. Other information on public health and welfare in Yuba County is not available.

2.2 GEOLOGY

2.2.1 GEOLOGIC SETTING

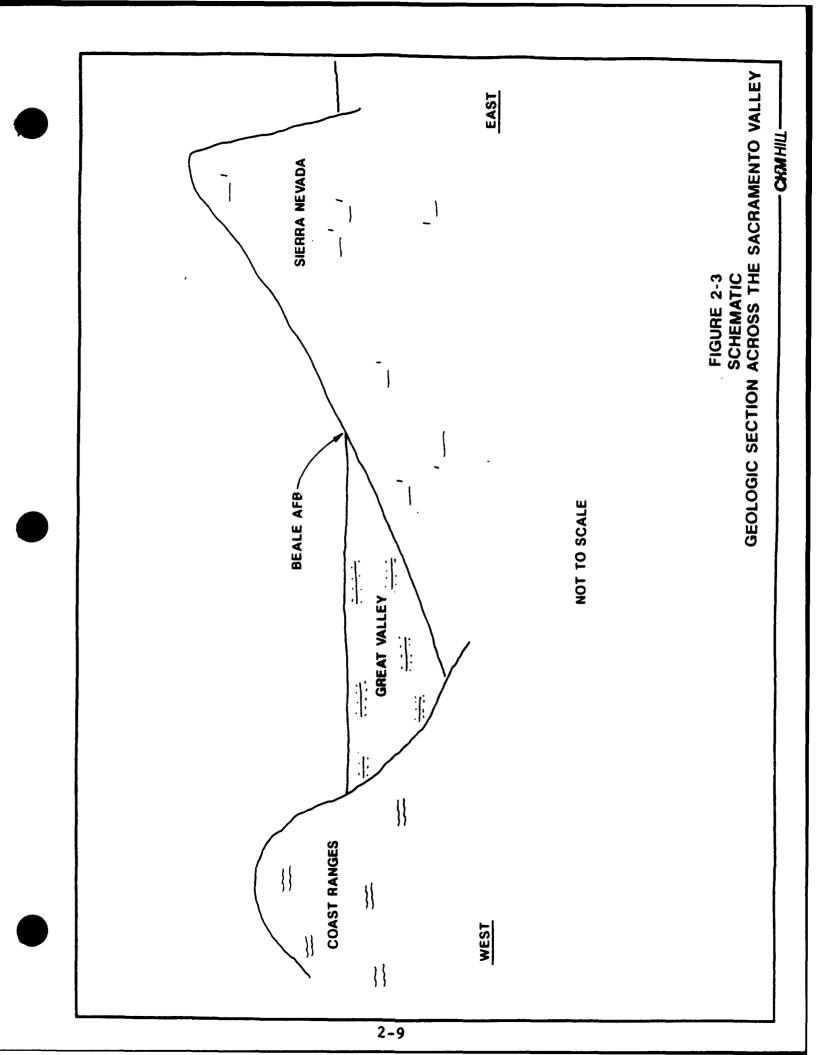
2.2.1.1 Geomorphology

Beale AFB lies on the boundary of two geologic provinces in California: the Great Valley Province and the Sierra Nevada Province (Figure 2-3). The Sierra Nevada Province is a strongly asymmetric mountain range. It has formed as a huge block of the earth's crust has been uplifted along a fault system on the east side of the range and tilted westward. This has resulted in the Sierra Nevada having a long gentle western slope and a steep eastern escarpment.

The Great Valley Province was formed as a structural downwarp between the Coast Range Province on the west and the Sierra Nevada Province on the east. It has been filled with alluvial deposits derived from the erosion of the Sierra Nevada and the Coast Ranges. Extending more than 400 miles from north to south and averaging about 60 miles across, the Great Valley comprises the Sacramento Valley in the north and the San Joaquin Valley in the south. On its eastern boundary the alluvial deposits of the Great Valley overlap bedrock of the Sierra Nevada block, which continues to slope gently to the west.

Because of its location on the boundary of the two provinces, Beale AFB displays characteristics of both the Great Valley and the Sierra Nevada. The western portion of the base is relatively flat grassland, characteristic of the Great Valley. Moving eastward, the plains transition to low rolling hills which gradually merge with the foothills of the Sierra Nevada.

Three goomorphic units characteristic of the Great Valley Province are present at Beale AFB. These include river



flood plains and channels, low alluvial plains and fans, and dissected uplands. These units are shown conceptually on Figure 2-4.

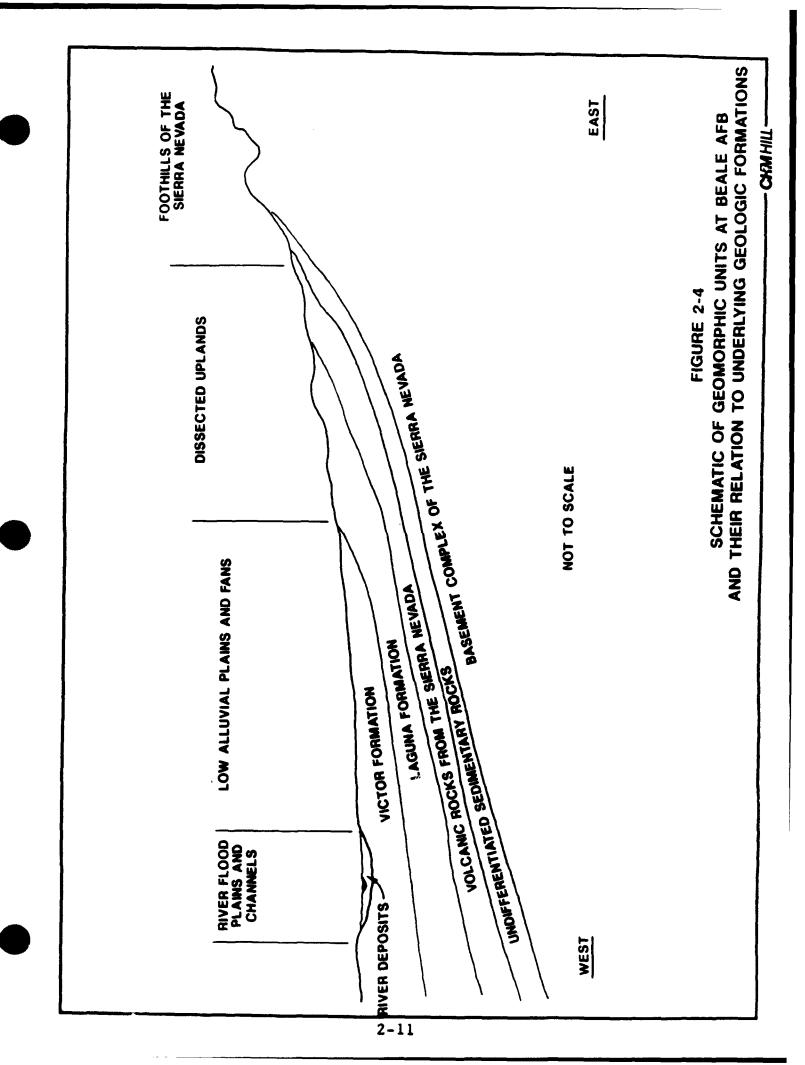
River plains and channels lie along the major drainages at Beale AFB. As these streams have meandered in recent geologic time, they have deposited sands and gravels along their channels, and silts and clays on their flood plains. Where present, these deposits may range in thickness up to about 100 feet on the western edge of the base. Low alluvial plains and fans comprise most of the western part of the base. This unit is generally flat to gently rolling and is composed of alluvial deposits of mainly Pleistocene age. Unlike the river flood plains and channels, little or no deposition is taking place on this surface. As a consequence, a mature soil profile has developed which contains cemented sediments in many locations. Surface water drainage on this unit is mainly southwesterly, normal to the trend of the Sierra Nevada (Olmsted and Davis, 1961).

Dissected uplands form the eastern edge of the Great Valley, and comprise most of the central portion of Beale AFB. This unit ranges from gently rolling land to dissected hills with relief of up to several hundred feet. Dissected uplands are composed of unconsolidated to semiconsolidated continental deposits mainly of Pleistocene and Pliocene age (Poland and Evenson, 1966). This surface is being eroded at the present time.

Moving eastward into the foothills of the Sierra Nevada at Beale AFB, the topography gets progressively steeper and outcrops consist of mostly older consolidated sedimentary rocks of Oligocene to Pliocene age. On the eastern boundary of the base are exposures of the crystalline basement rock of the Sierra Nevada, which range in age from Mesozoic to Paleozoic.

2.2.1.2 Geologic History

With of the geologic history of California is associated with the formation and evolution of the Sierra Nevada mountains. The ancestral Sierra Nevada first formed with the intrusion of igneous granitic plutons into existing sedimentary rocks, during the Mesozoic Era (70-225 million years before present (mybp). These existing rocks, which were of Mesozoic and Paleozoic age, were extensively deformed and metamorphosed. Collectively, the intrusive activity and resultant uplifting is known as the Nevadan Orogeny. It resulted in the formation of the Nevadan Mountains, the



western slopes of which formed the edge of the continent at that time. Sediments from erosion of these newly elevated areas were transported by rivers and streams and deposited on a continental shelf area, later to become the location of the Great Valley.

Erosion of the original Nevadan Mountains continued through the Eocene epoch (40 mybp) and substantially lowered the elevation of the mountain range. Faulting, which has occurred since the Eocene, has rejuvenated the mountainbuilding process by elevating them to their present form as the Sierra Nevada. Erosion has continued to move sediments from the higher elevations to the Great Valley.

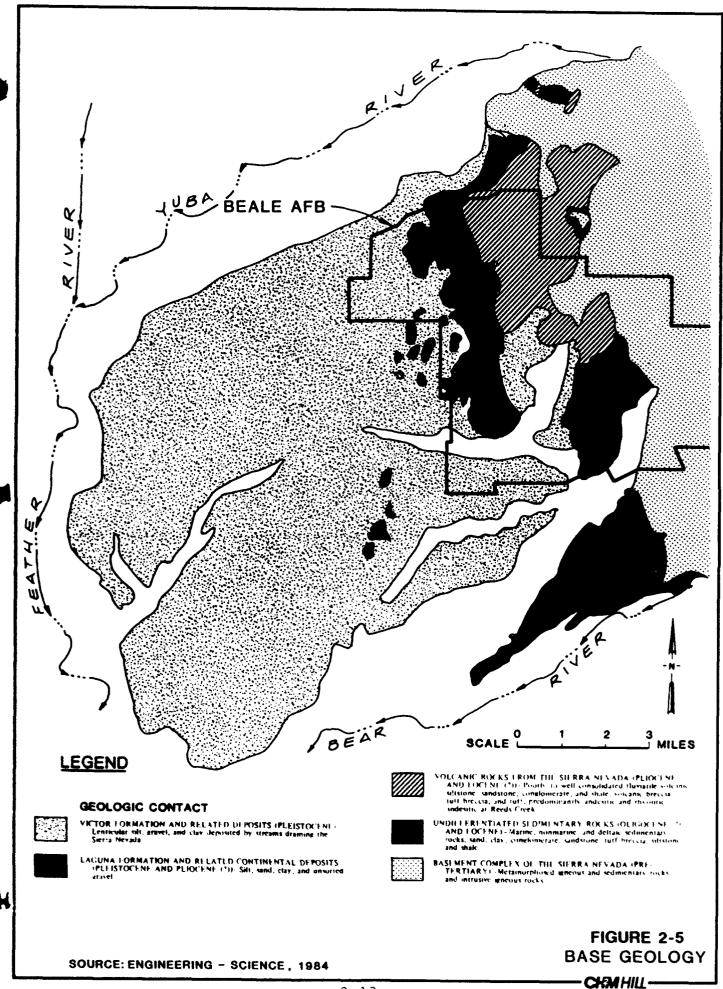
Approximately 40 mybp and simultaneous to the erosion of the original Nevadan Mountains, the Coast Mountain Ranges were first formed. This created a large closed marine basin (ancestral Great Valley) between the Nevadan Mountains to the east and the Coast Ranges to the west. This basin continued to receive sediments from both of these mountain ranges. By Pliocene time (7 mybp), most of the valley's seas had been drained via the Carquinez Straits near present San Francisco. Brackish and freshwater lakes replaced the marine waters. Alluvial fans developed along the eastern and western margins of the valley and the Great Valley evolved to its present form.

2.2.2 BEDROCK GEOLOGY

2.2.2.1 Description

Beale AFB is located along the boundary of the basement complex (ancient core of crystalline rock) of the Sierra Nevada and the sedimentary deposits of the Great Valley (Figure 2-3). The rocks of the Sierra Nevada range in age from Paleozoic to Mesozoic. The deposits of the Great Valley range in age from Tertiary to Quaternary. Figure 2-5 shows the geology of the base and its vicinity. A detailed geologic map of Beale AFB may be found in Page (1980).

Along the eastern coundary of the base, the Sierra Nevada basement complex outcrops sloping to the southwest. The complex consists of metamorphosed igneous and sedimentary rocks and intrusive igneous rock, and constitutes the bedrock in the vicinity of Beale AFB. These rocks are actually part of a belt of rocks which flank and predate the main granitic batholith of Sierra Nevada that lies to the east (Bateman and Wahrhaftig, 1966). The depth to the basement complex ranges to over 5,000 feet by the confluence of the



2-13

Bear and Feather Rivers. At Beale AFB and areas to the west there are no known water wells reaching into the basement complex, although a shallow monitoring well at Site 16 (the Explosive Ordnance Disposal Area) appears to enter this unit at a depth of 5 feet. The groundwater in the basement rocks is limited mainly to fractures (Page, 1980). The basement complex is overlain by fine-grained sedimentary marine rocks of Eocene Age which consist of clay, sandy clay, silty clay, sand and claystone. These rocks do not outcrop at the base, but have been identified in subsurface investigations at depths of between 315 to 865 feet (Page, 1980).

The fine-grained sedimentary rocks are overlain by undifferentiated sedimentary rocks of marine, non-marine, and deltaic origin. These sedimentary rocks only outcrop in a few isolated places on the base. However, they are fold under the base at depths of up to 450 feet, sloping gent. to the southwest and ranging in thickness from zero to about 150 feet. Only a few water wells are known to reach these deposits and they do not pump exclusively from these rocks (Page, 1980). The fine-grained sedimentary rocks and a portion of the undifferentiated sedimentary rocks are marine deposits that contain connate groundwater with a high concentration of total dissolved solids, ranging from about 500 mg/l to over 10,000 mg/l near their base (Black and Veatch, 1985). Thus, the top of these deposits constitutes the effective base of the potable groundwater reservoir.

Overlying the undifferentiated sedimentary rocks are volcanic rocks from the Sierra Nevada. These sedimentary deposits consist of dark, poorly to well consolidated alluvial volcanic siltstone, sandstone, conglomerate, and shale of Pliocene and Eocene age derived from volcanic rocks in the Sierra Nevada. The volcanic sediments outcrop mainly along the eastern part of Beale AFB and slope gently toward the southwest. They range in depth from zero to 270 feet, and in thickness from zero to 325 feet (Page, 1980).

2.2.2.2 Structure and Seismic Activity

The Great Valley is a large geosyncline with a southward tilt along a north-south trending axis. As described above, the basement crystalline complex of the Sierra Nevada slopes gently to the southwest, buried under the increasingly thick sedimentary deposits of the Great Valley. On the western side of the valley, the bedrock complex of the Coast Range rises abruptly against the Sierran rocks (Figure 2-3).

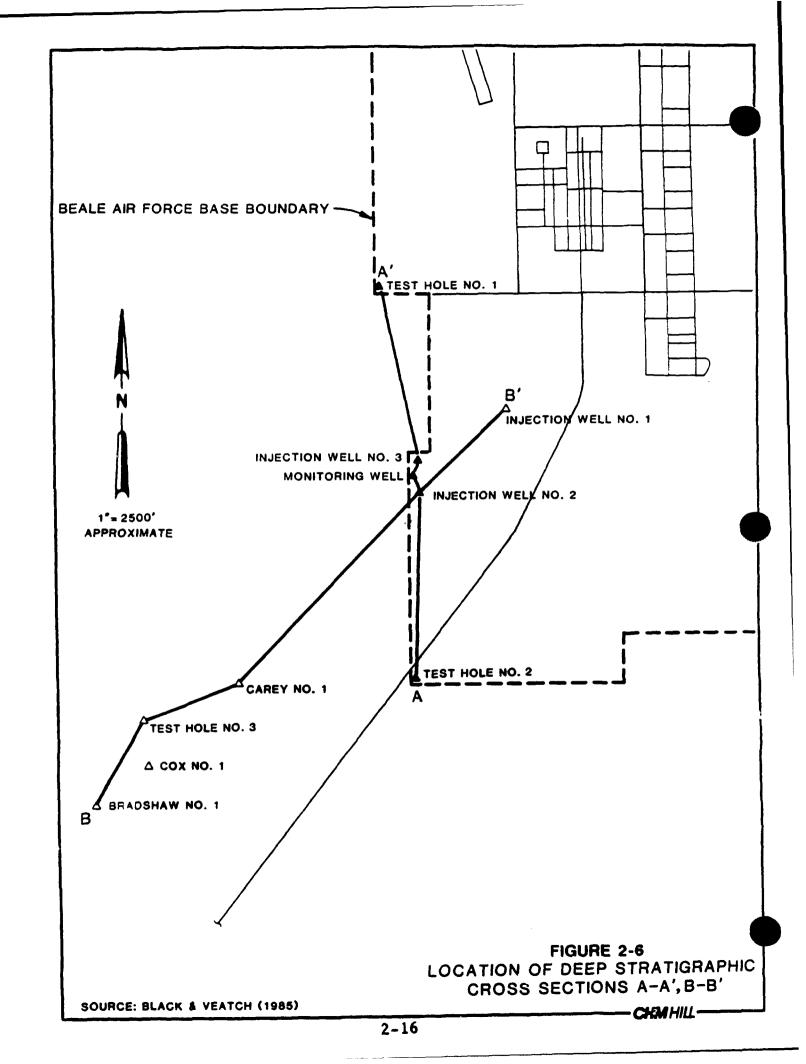
The most recent seismic activity in the vicinity of Beale AFB was the minor movement which took place along the Cleveland Hill Fault about 25 miles north of the base and accompanied the 1975 Oroville earthquake sequence (Black and Veatch, 1985). Other mapped faults in the area include the Highway 49 lineament about 20 miles east of Beale AFB and a shear zone located a few miles east of the base that trends in a northwesterly direction. There are no known active or inactive faults within the boundaries of Beale AFB (Black and Veatch, 1985).

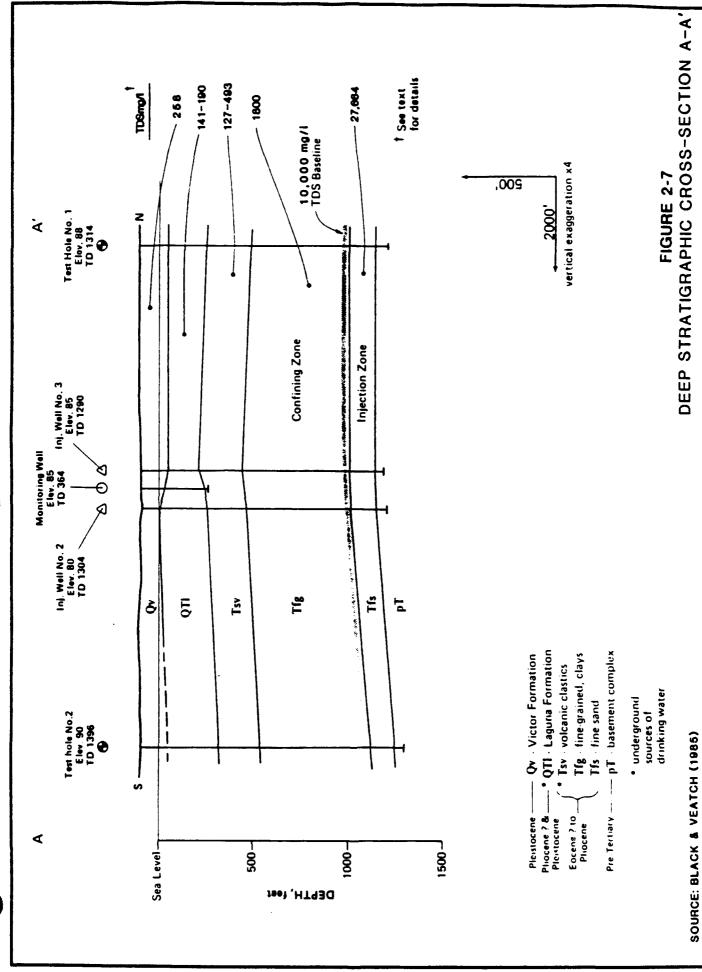
2.2.3 SURFICIAL GEOLOGY

2.2.3.1 Unconsolidated Deposits

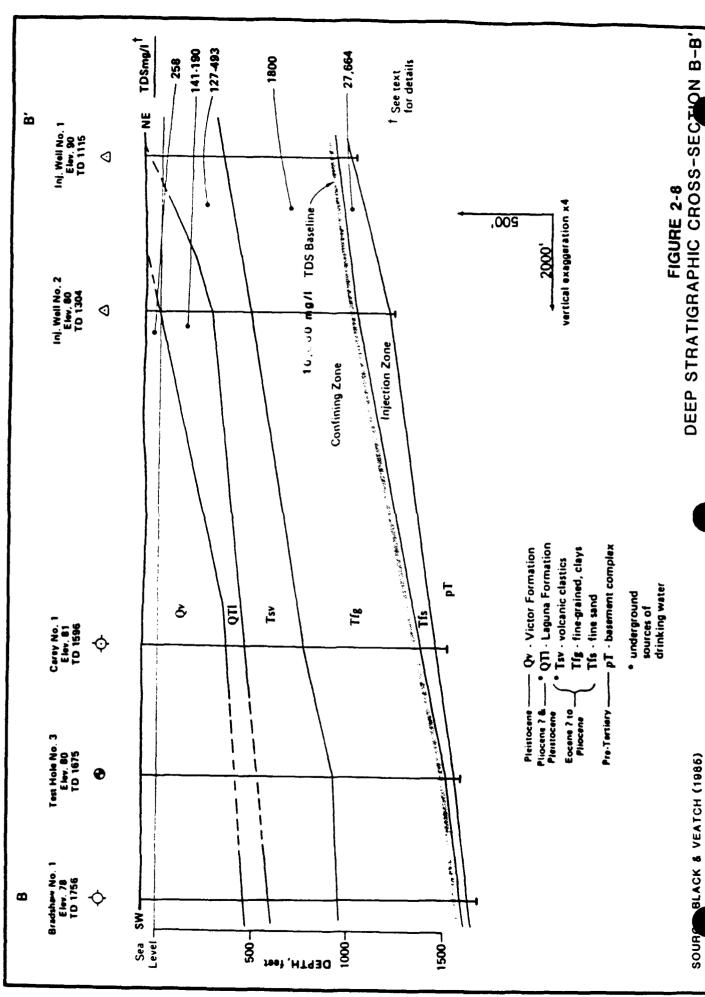
Unconsolidated deposits overlie consolidated sediments at Beale AFB, and these in turn lie over the basement complex of the Sierra Nevada. Figure 2-6 shows the locations of two deep geologic cross-sections (illustrated in Figures 2-7 and 2-8), and Plate 2 shows the locations of three shallower cross-sections (illustrated in Figures 2-9 through 2-11). The soil boring logs on which the shallow cross-sections were based are collected in Appendix D. Table 2-5 summarizes the stratigraphy underlying Beale AFB and describes the water-bearing characteristics of the geologic units. Because these formations were deposited over the crystalline basement complex of the Sierra Nevada which slopes to the southwest, the depth to the tops of the formations and the thickness of the formations increases toward the west. These relationships are shown in the deep cross-sections (Figures 2-7 and 2-8). Penetration resistances were recorded at various depths in soil borings, and are included with soil boring logs in Appendix D.

The first unit that overlies the volcanic rocks of the Sierra Nevada is the Laguna Formation and related continental deposits (the Arroyo Seco Gravels). This unit is exposed at the middle of Beale AFB, and comprises the materials that correspond to the dissected alluvial uplands geomorphic unit. The Laguna Formation deposits are predominantly fine-grained, poorly-bedded, somewhat compacted continental deposits, consisting of silt, clay and sand of Pleistocene and Pliocene age. The Arroyo Seco gravels are coarse-grained and poorly sorted. These gravels form a discontinuous cap on the Laguna Formation, and were mapped together with the Laguna Formation by Page (1980). The Laguna Formation ranges in thickness from zero to 180 feet and slopes gently to the southwest. Soils developed on the

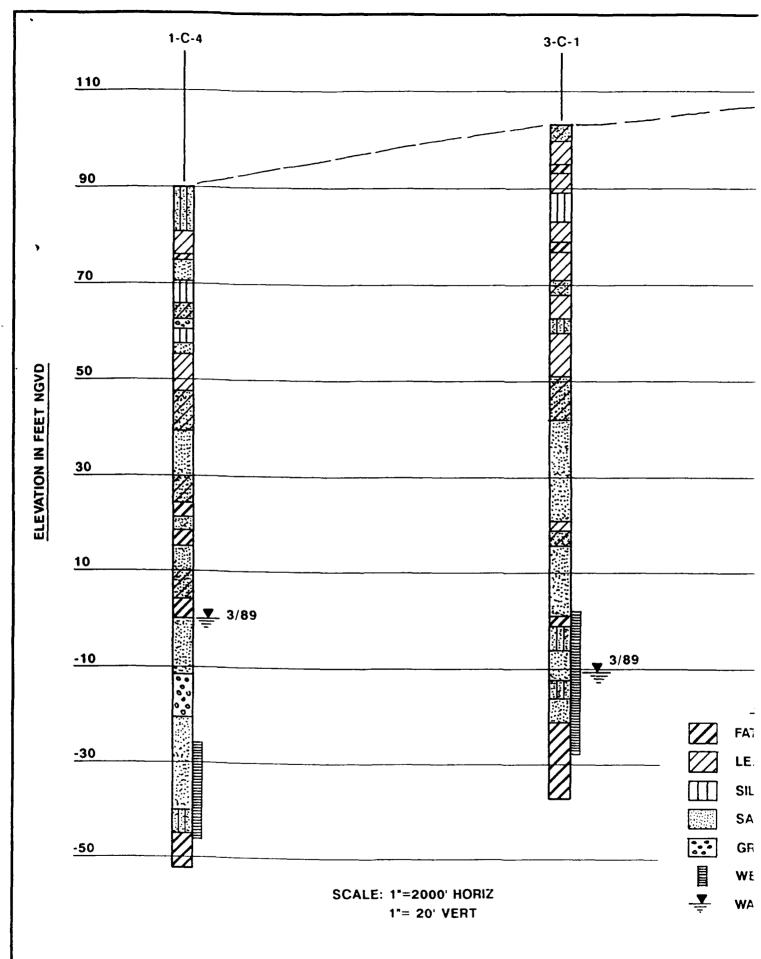




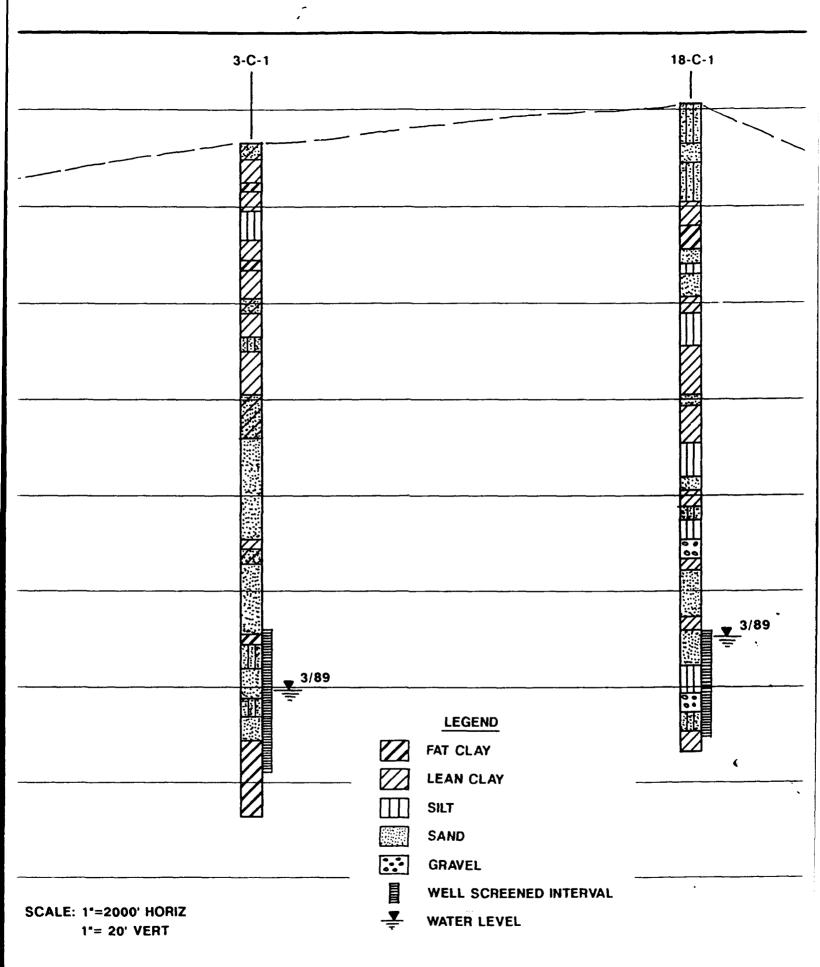
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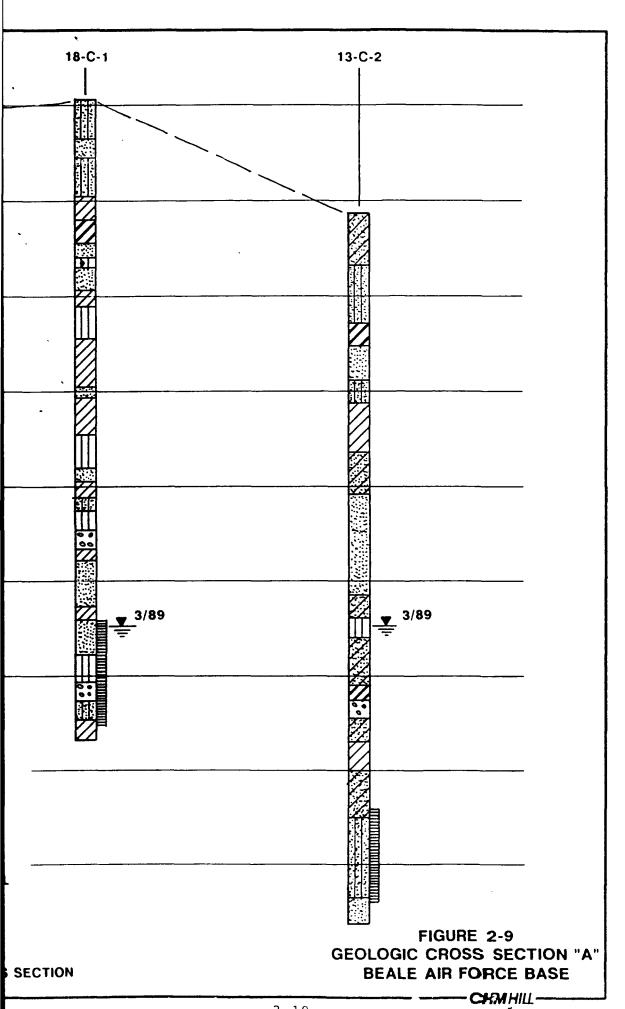


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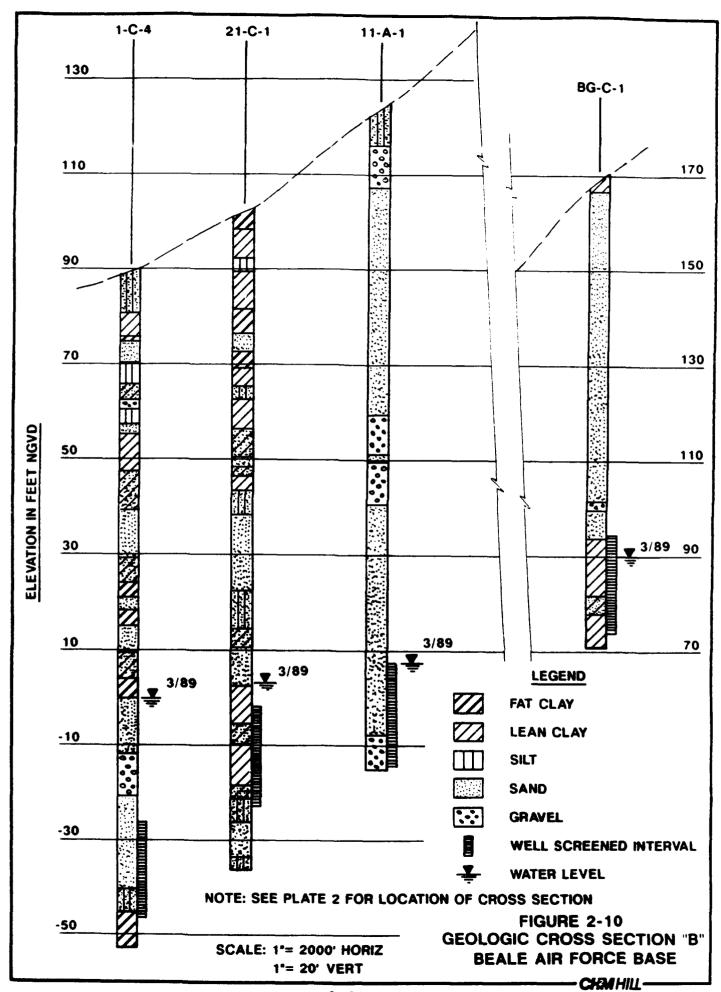
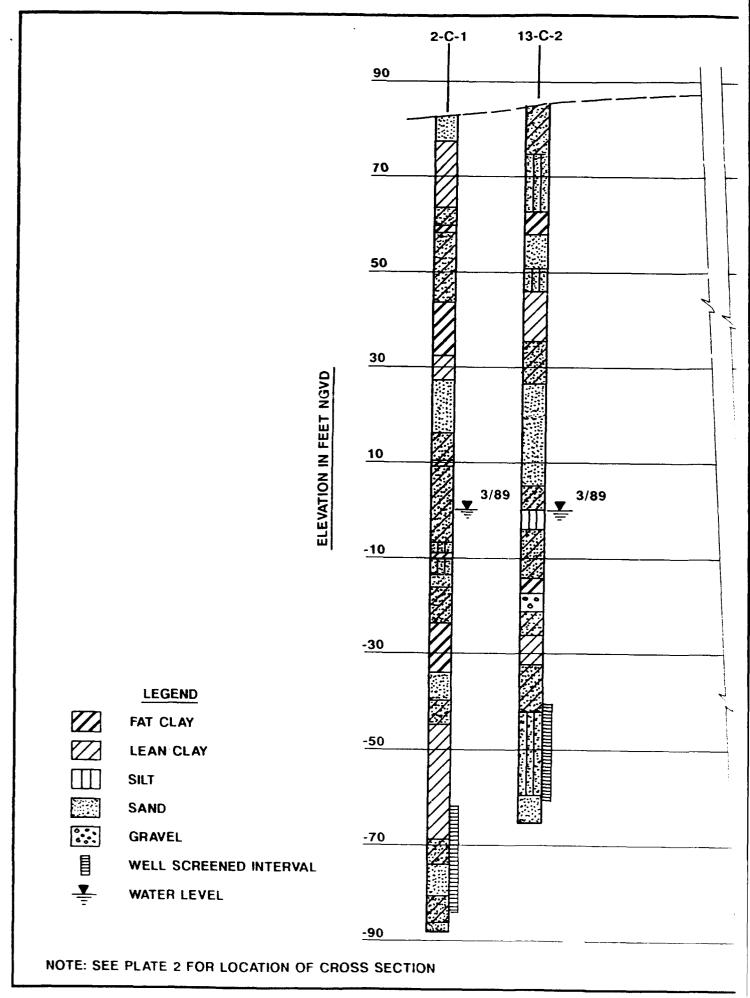


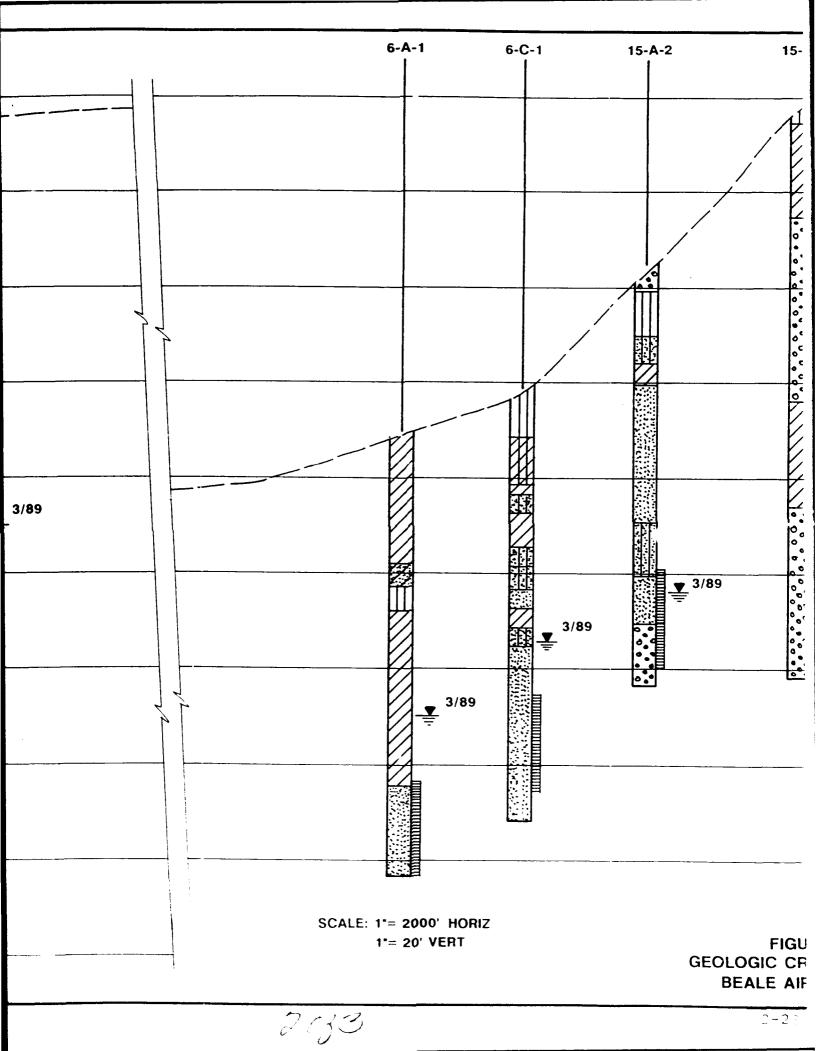
Table 2-5 CEOLOGIC UNITS NEAR BEALE APB

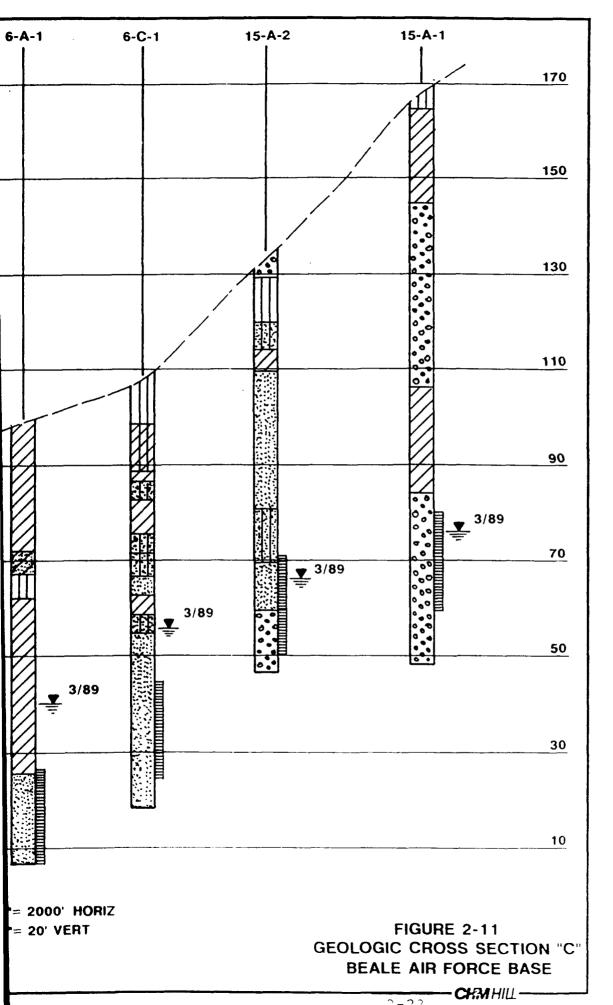
Syelem and Serles	Ceologic Unit	Lithology	Thick- ness (feet)	Depth.	Mater-Bearing Classucterial test
QUATERNARY Holocene	River deposits	Continental deposits of silt, sand, and gravel, with minor amounts of clay	06-0	0-100(1)	Soils on river deposits have permeabilities of 15 to 80 gpd/ft.
QUATERNARY Pleistocene	Victor Pormetion	Continental deposits of silt, sand, and gravel	0-135	06-0	Must permeable deposits on cast side of Sacramento Valley. Well yield ranges from 1,000 to 1,600 gpm.
		•			Solls on the Viceer and related deposits contain hardpan.
QUATERNARY AND TERTIARY(1) Pleistocene(1) and Plicene	Legune Formation and related conti- nental deposits	Continental fine- grained sedimenta to poorly-sorted gravels	0-180	0-175	Yields ranging from 100 to 3,100 gpm. Soils on the Laguna Formation contain hardpan.
TERTIARY Pilocene and Eccene(?)	Voicentce from the Sierra Mevada	Fluvial volcanic ailtetone, sandetone, conglomerate	0-325	0-270	Wells perforated in the volcanics have yields ranging from 415 to 2,500 8pm.
TERTIARY Oligocene(7) and Eccene	Fine-grained sedimentary rocks	Clay, sandy clay, silty clay, sand, and clayetone	;	315-865	Limited; top of unit is the effective base of groundwater reservoir.
	Undifferentiated sedimentary rocks	Marine, non-marine, and deltaic sedimen- tary rocks	0-150	0-455	Limited.
MESOZOIC AND PALEOZOIC	Basement complex	Metamorphosed igneous and sedimentary rocks and intrusive igneous rocks	1	1-5000	Limited to rock fractures. No known wells in the basement complex.
Depth to the top of the unit.	he unit.				

Depth to the top of the unit.

Source: U.S.G.S., Page, 1980







Laguna Formation may contain cemented sediments which restricts the vertical flow of water in some places (Page, 1980).

Overlying the Laguna Formation and exposed along the western and southwestern base boundary is the Victor Formation. It comprises the materials of the low alluvial plains and fans geomorphic unit described in Section 2.2.1.1. The Victor Formation consists of heterogeneous mixtures of clay, silt, sand, and gravel of Pleistocene age deposited by meandering streams; in some places buried channel gravels may exist. As with the Laguna Formation, it contains layers of cemented sediments that restrict the vertical flow of water in The Victor Formation slopes gently to the southwest places. and ranges in thickness from zero to 135 feet (Page, 1980). This formation is very similar to the Laguna Formation both texturally and lithologically, and the two are difficult to tell apart in the subsurface. Both are highly productive for wells. Beale AFB obtains its water supply from the Victor Formation. Nearby wells west of the base obtain their water mainly from the unconsolidated deposits of the Victor Formation, Laguna Formation, and volcanic rocks from the Sierra Nevada (Rockwell, 1978).

The youngest and shallowest deposits at the base are river deposits consisting of silts, sands, and gravel. At Beale AFB, they are found along the Hutchinson and Dry Creek drainage course, and comprise the flood plain and river channel geomorphic unit. These Holocene-age alluvial deposits do not typically contain layers of cemented sediments (Page, 1980).

2.2.3.2 Soils

Soils at Beale AFB have been recently mapped by the Soil Conservation Service (SCS, 1985). The formation of soil at a particular location is controlled by the geology, landforms, relief, climate, and vegetation at that location. The resulting characteristics of a particular soil, such as its texture, permeability and mineralogy, may affect the movement of contaminants. Detailed soil maps, profile descriptions, and tables of engineering properties may be found in the Soil Survey (SCS, 1985).

Much of the western portion of the base is covered by San Joaquin loam. This is a moderately deep, moderately well-drained soil formed on old alluvial terraces at an elevation of between 60 and 130 feet NGVD. San Joaquin loam typically contains a layer of hardpan at a depth of between 20 and

40 inches. The infiltration rate is moderate (0.6 to 2.0 inches per hour) above about 16 inches in silt and silty clay, and very slow (less than 6.06 inches per hour) below this depth in clay.

Redding-Corning gravelly loams cover most of the central part of the base, including the flightline and cantonment areas. These soils are moderately deep to very deep and are well-drained. They form on old alluvial terraces at an elevation of between 110 and 250 feet. A layer of hardpan is commonly found at a depth of between 20 and 40 inches. The infiltration rate is moderate (0.6 to 2.0 inches per hour) in the upper 2 feet in clayey and silty sands and gravels. Below this depth the permeability is very slow in clays.

Pardee-Pardee Variant complex and Pardee gravelly loam covers much of the northeastern part of the base including the area around Site 16 (Explosive Ordnance Disposal Area). These are shallow, well-drained soils formed in gravelly and cobbly alluvium on old dissected alluvial terraces above unrelated igneous bedrock at an elevation of between 120 and 250 feet. The infiltration rates of the soils are moderately slow to moderate (0.2 to 2.0 inches per hour) in silty and clayey sands and gravels.

On the northeastern edge of the base in the foothills between elevations of about 125 and 1,100 feet are found Auburn-Argonaut loams. These soils are shallow to moderately deep and well-drained, formed in residuum from basic metavolcanic rock. Bedrock may be found at depths of 10 to 40 inches beneath the Auburn-Argonaut loams. Infiltration rates range from very slow to moderate (less than 0.06 to 2.0 inches per hour) in silts and clays.

Along the drainages at Beale AFB, including the unnamed creek which flows through Site 1 (West Drainage Ditch) and along Hutchinson Creek and its tributaries, are found Perkins loam and Conejo loam. These are very deep, well-drained soils formed on stream terraces in alluvium derived from mixed sources. Perkins loam tends to be found along the upper reaches of the drainages. Its permeability is moderately slow (0.6 to 2.0 inches per hour), and it is composed of silts and clays, with some silty and clayey gravel below about 5 feet in depth. Conejo loam is normally found in the lower reaches of the drainage courses. This soil shows a moderate infiltration rate (0.2 to 2.0 inches per hour) in silts and clays.

2.3 HYDROGEOLOGY

2.3.1 GROUNDWATER

2.3.1.1 Occurrence and Movement

Groundwater in the vicinity of Beale AFB flows mainly through the alluvial deposits of the Victor Formation, Laguna Formation, and volcanic rocks from the Sierra Nevada. Because of the complexity of the alluvial deposits, there are no clearly defined local aquifers. Alluvium comprises the sediments deposited by water in stream beds, flood plains, lakes, and fans. Stream channels constantly shift their positions and depositional erosional velocities through geologic time. The resulting alluvial deposits are characterized by extreme heterogeneity of particle size and distribution such that hydraulic properties are also highly variable. The meandering stream depositional environment produces relatively thin, laterally discontinuous channel deposits. Channel deposits of coarse-grained materials, which are narrow in cross-section, may be continuous for long distances in the direction of stream flow. Since groundwater flows preferentially through materials of higher hydraulic conductivity, these channel deposits may serve as primary contaminant migration pathways. However, these pathways may not be correlatable on geologic cross-sections constructed from soil boring logs.

The layered character of alluvial deposits causes the aquifer system to display a strong horizontal versus vertical anisotropy. Usually, horizontal hydraulic conductivities of aquifer materials will tend to be much greater. Because of the heterogeneity and anisotropy characteristic of alluvial systems both horizontally and vertically, aquifer characteristics such as hydraulic conductivity may vary by several orders of magnitude within a few feet in any given direction.

Subsurface investigations at Beale AFB have failed to detect large regional geologic features in the upper alluvial formations that influence groundwater flow. Coarse-grained deposits appear to be minor and embedded within fine-grained deposits, although a thick sequence of coarse sands and gravels was noted at several sites in the northern part of the base, particularly at Site 1.

The presence of fine-grained clays and silts causes groundwater to be confined or semiconfined locally. These clay and silt deposits tend to be lenticular and gradational laterally. Near-surface groundwater may be perched in certain locations. With increasing depth, the groundwater typically exhibits greater degrees of confinement. Thus, the response of groundwater levels to pumping may be complex.

A summary of the lithology, thickness, and water-bearing characteristics of the geologic units at Beale is provided in Table 2-5. The base of the fresh-water aquifer may be considered to be the top of the fine-grained sedimentary marine deposits that lie over the basement complex (unit Tfg on Figure 2-8). The depth to the base of the this unit ranges from zero feet on the eastern edge to over 1,000 feet in the southwestern corner of Beale AFB. In the eastern part of the base, where the alluvial deposits are absent and the basement complex outcrops, groundwater is restricted to flow in fractures within the rock (Page, 1980).

Beale AFB is located along the eastern margin of the Sacramento Basin Hydrologic Area as designated by the California Department of Water Resources (DWR, 1980). Groundwater movement within this margin, at the turn of the century, was from the Sierra Nevada foothills in the east toward the Feather and Sacramento Rivers to the west. The river system thus served as discharge points for the groundwater. As a result of extensive groundwater extraction, primarily for crop irrigation since the turn of the century, the major discharge for the groundwater has been through well withdrawal. This has altered the direction of groundwater movement in many places throughout the Sacramento Valley, including areas near Beale AFB. The rivers no longer serve as groundwater discharge points. In fact, water from the river channels recharge the groundwater system.

Another source of recharge to the regional groundwater reservoir is along outcrops of the alluvial formations on the eastern edge of the Great Valley, which at depth constitute the major water supply aquifers. Percolation of rainwater or irrigation waters through these materials reaches the groundwater reservoir. However, only lands with sufficiently permeable soil will permit percolation. Soils containing cemented sediments restrict the downward movement of water locally (DWR, 1978). Recharge from groundwater in fractures of the consolidated rocks may also contribute water to the regional aquifer.

The primary regional discharge is to agricultural pumping west of Beale AFB. For the period 1966-71 and for 1975, the regional pumping discharge ranged from 96,000 to

129,000 acre-feet per year (Page, 1980). The primary source of pumping discharge at Beale AFB is from the nine water supply wells located in the northwest corner of the base (Figure 2-12). From 1960 to 1975 pumping from these wells ranged from 1,370 to 4,240 acre-feet per year. Table 2-6 gives construction details for the base water supply wells.

Figures 2-13 through 2-15 present regional groundwater elevation contours in 1976 and 1986. These figures show that groundwater in the vicinity of Beale AFB flows toward a large depression induced by pumping west of the base. Page (1980) locates the center of the depression in the northeast quarter of T14N, R4E and the northwest quarter of T14N, R5E. The figures show that recharge to the groundwater system is from the Yuba, Bear, and Feather Rivers, and from the eastern part of Beale AFB. The depression is probably not caused by intensive pumping from one or a handful of wells. Most likely the groundwater withdrawal is widespread regionally. The geometry of the depression appears to be a result of the availability of recharge from rivers on three sides. Recharge to the Beale AFB well field appears to be mainly from the Yuba River to the north.

In effect, all of Beale AFB is within the zone of ground-water recharge to the groundwater depression west of the base. Plates 3 and 4 show groundwater elevation contours plotted on water levels in March and November 1989. Flow lines throughout the base may be expected to converge on the groundwater depression. In addition, location within a zone of recharge implies that there is a vertical component of groundwater flow downward. Thus, contaminants that may enter the groundwater system in the vicinity of Beale AFB may move down gradient toward the depression. Plates 3 and 4 also demonstrate that the groundwater gradient becomes steeper toward the northeast at Beale AFB. This change reflects the dip of geologic materials in the region and represents a transition from the Great Valley to the foothills of the Sierra Nevada.

Groundwater levels have generally been declining since the onset of agricultural pumping. However, there is evidence that in recent years this trend has lessened and even begun to reverse. Based on a study of water levels in regional wells, Page (1980) concluded that in the 1960s water levels declined less rapidly than in earlier years, and in the 1970s declined only slightly. However, between 1977 and 1980, the water table declined sharply once more in response to drought and increased rice production. Since 1980, the

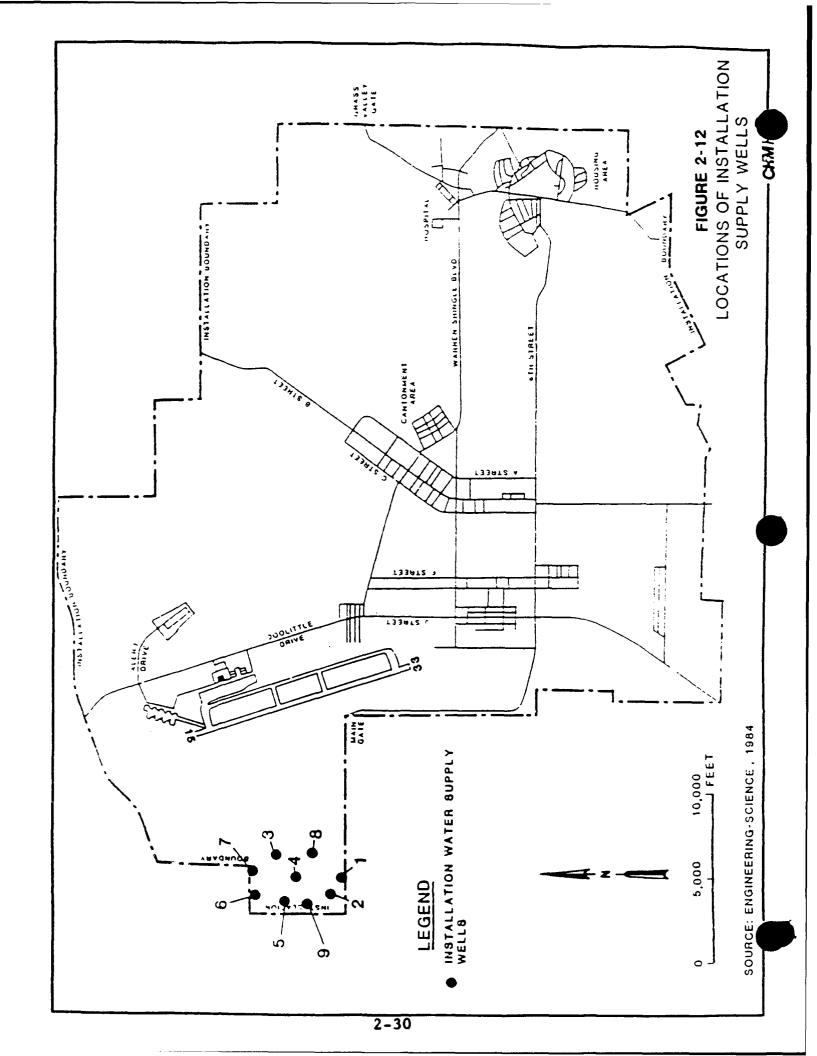
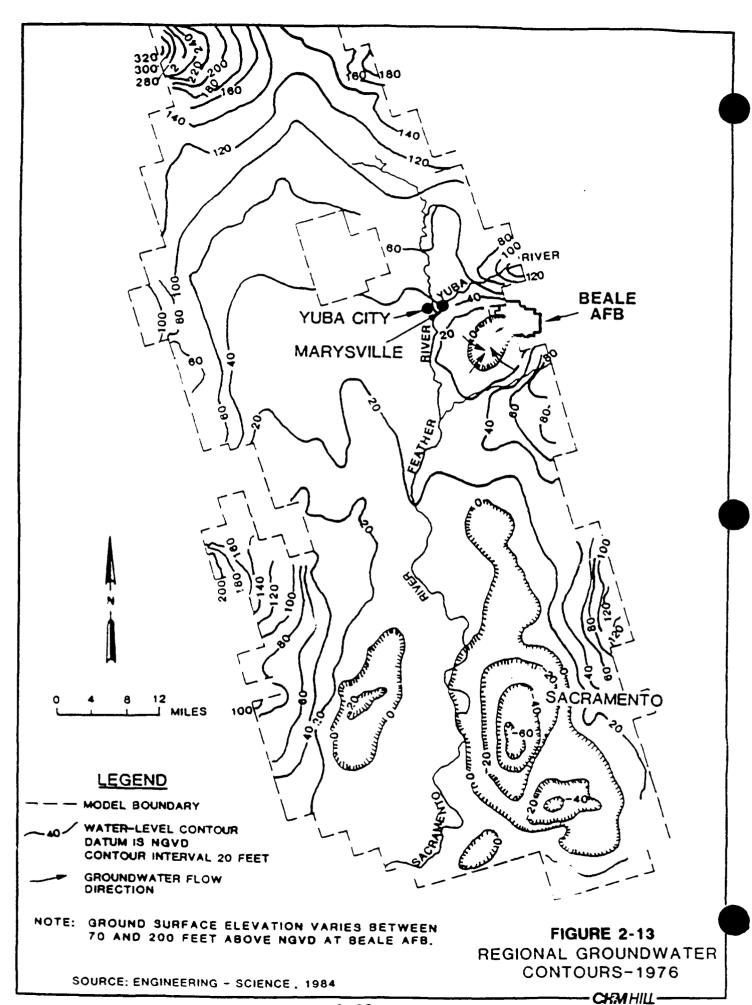
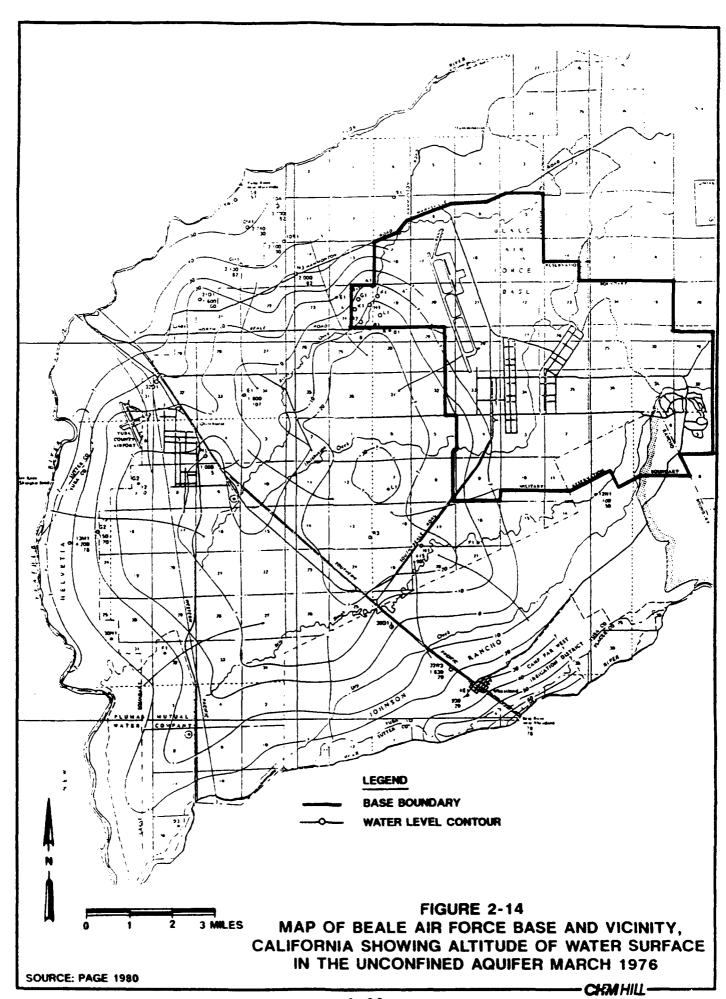


Table 2-6
CONSTRUCTION DETAILS FOR INSTALLATION
WATER SUPPLY WELLS

Installation Number	U.S.G.S. Number	Depth (feet)	Perforation Intervals (feet)	Casing Diameter (inches)
1	15N/4E-24R1	296	175-296	12/16
2	15N/4E-24R2	326	145-160	16
3	15N/5E-19F1	264	152-251	
4	15N/4E-24H1	405	158-288	16
5	15N/4E-24G1	299	112-154 210-224 238-280	16
6	15N/4E-24B1	313	130-156 192-213 235-241 252-264 289-299	16
7	15N/4E-24A1	300	140-270	16(?)
8	15N/5E-19L1	405	129-206 280-293	?
9	15N/4E-24K1	370	186-330	?

Source: Page, 1980.





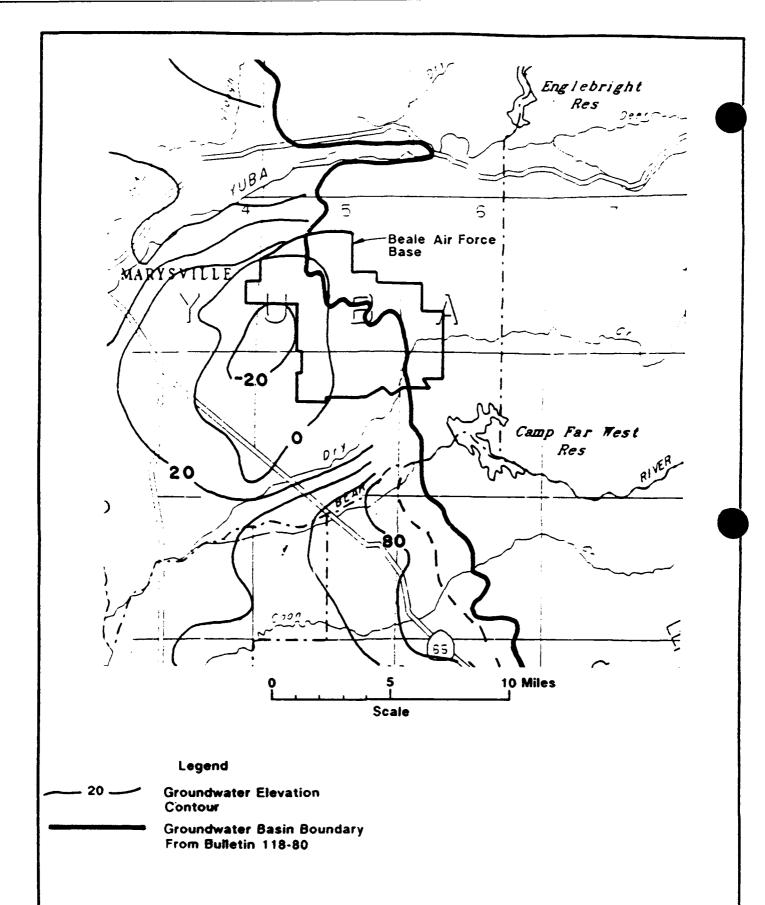


FIGURE 2-15
ELEVATION OF WATER
IN WELLS, SPRING 1986

SOURCE: CALIFORNIA DWR, 1986

- CHEMIHILL-

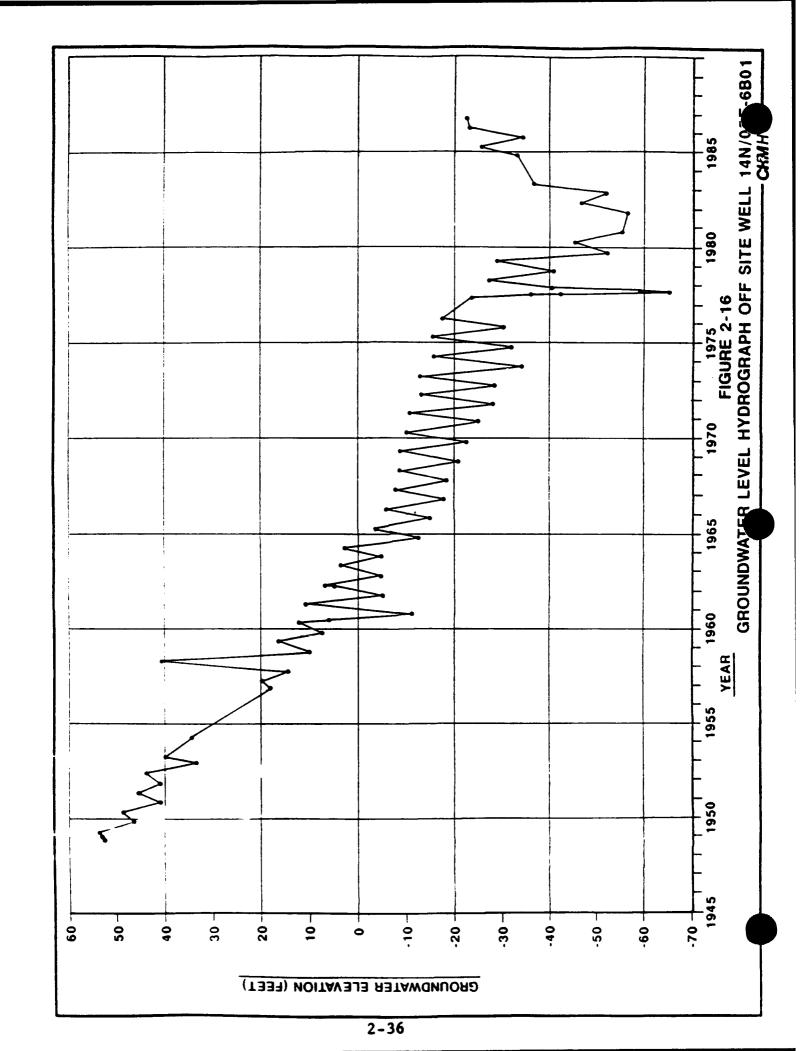
water levels have actually begun to rise in response to increased precipitation during the early 1980s and decreased rice production (AeroVironment, 1987). In addition, the Brophy and South Yuba Water Districts constructed the Yuba-Goldfields Canal in 1984 and 1985. This canal delivers Yuba River water to about 20,000 acres of agricultural land west of Beale AFB, which has reduced the demand on groundwater for irrigation in the area.

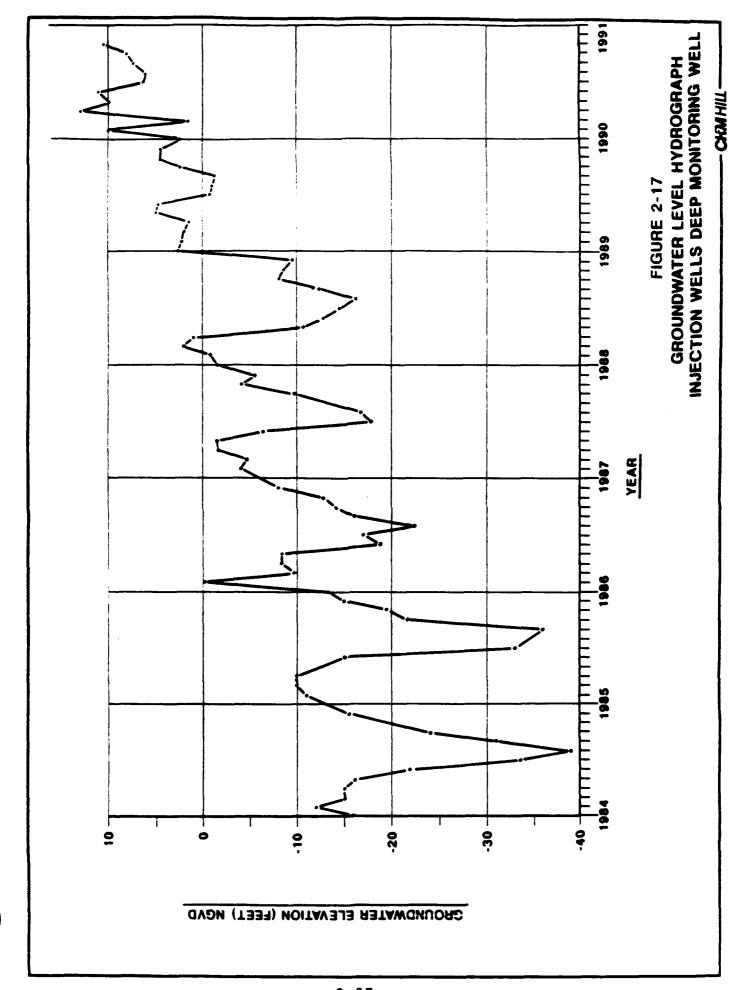
Figure 2-16 presents a groundwater level hydrograph on data collected by the DWR between 1948 and 1986 from well 14N/05E-6B01, which is located near the center of the groundwater pumping depression west of the base. This figure shows that the water table in the well declined over 100 feet between 1948 and 1980. However, in recent years the water table has recovered nearly 40 feet.

A seasonal fluctuation in the groundwater level is also illustrated in Figure 2-16. This fluctuation varies from about 4 feet to as much as 20 feet in a year. Groundwater levels typically reach their lowest point in the fall, after the dry season and in response to the demands of irrigation pumping. The levels attain their highest point in spring, after the wet season and prior to the onset of agricultural pumping.

Figure 2-17 presents a groundwater level hydrograph on data collected by Beale AFB personnel between 1984 and 1989 in the deep monitoring well located at Site 2 between injection wells No. 2 and No. 3. This figure shows that the average annual groundwater level has risen about 20 feet during this time. Seasonal fluctuations have ranged from about 15 to 30 feet per year. Groundwater levels taken between April 1986 and May 1989 in monitoring wells installed during the Phase II, Stage 1 investigation show that water levels in wells located on the western edge of the base have risen as much as 20 feet (well 2-A-1) during this time.

Water levels were monitored quarterly in most Beale AFB monitoring wells as part of the Stage 2-1 investigation. Hydrographs of groundwater levels in monitoring wells are provided in Section IV. Appendix G provides a summary of groundwater level data collected during IRP Phase II, Stage 1 and Stage 2-1 investigations at Beale AFB. The hydrographs and data show that most wells on the western side of Beale AFB have shown a continual rise in groundwater levels between 1986 and the end of 1989. Where downturns occur, they appear to be temporary and seasonal. The





long-term rise in groundwater levels in Beale AFB monitoring wells appears to be part of the regional rise described above.

On the other hand, wells constructed on the eastern side of Beale AFB have shown relatively steady groundwater levels. Most of these wells lie along or east of the boundary at which the groundwater gradient increases (Plates 3 and 4). These include the background wells, and wells at Sites 3, 10, 16, 19, and 23. Wells at Sites 6 and 15 have also shown relatively steady levels, although the gradient does not appear to increase in this area. In the long term, as water levels rise in the vicinity of the groundwater depression west of Beale AFB, while remaining constant on the eastern half of the base, the groundwater gradient will decline. This will have the effect of reducing the groundwater flow velocity.

Aquifer tests were performed on new monitoring wells installed during the Stage 2-1 investigation at Beale AFB. A discussion of testing methodology and plots showing pump drawdown and recovery data are provided in Appendix E. A discussion of the results of the tests at each site may be found in Section IV. As described in Section IV and Appendix E, values of aquifer parameters derived from pumping tests should be regarded as estimates. Values of transmissivity derived from the tests ranged from 3.4 square feet per day to 26,000 square feet per day, while values of horizontal hydraulic conductivity ranged from 0.17 feet per day $(6.0 \times 10^5 \text{ cm/sec})$ to 630 feet per day (0.22 cm/sec). This variation reflects the heterogeneity of aquifer materials in which the monitoring wells are screened. Values derived for the storage coefficient ranged from 9.6 x 10° to 0.068, which reflects a variation from confined to unconfined aquifer conditions at Beale AFB.

Aquifer parameters derived during the 72-hour drawdown and 72-hour recovery test in pumping well 19-C-4 may be regarded as representative average values for the hydrogeological materials in the uppermost portion of the aquifer at Beale AFB. The average value for transmissivity obtained from this test was 1,700 square feet per day, while the average value of horizontal hydraulic conductivity was 28 feet per day (0.01 cm/sec).

Page (1980) estimated the transmissivity of the aquifer materials in which the Beale AFB production wells are screened by noting yields and assigning values to geologic materials described on drillers' logs. He arrived at an

average value of transmissivity of 12,000 square feet per day. He also estimated the storage coefficient to be 0.0003.

Plates 3 and 4 present groundwater level contours plotted on data collected from monitoring wells screened across the uppermost permeable zone at or near the surface of the water table throughout the base in March and November 1989. Figure 2-18 presents groundwater contours drawn on south Beale AFB wells in May 1989, while Figure 2-19 presents contours drawn on similar data for north Beale AFB wells. contour plots all show that the groundwater gradient is steeper in geologic materials associated with the foothills of the Sierra Nevada on the east of the base. As groundwater enters the unconsolidated sediments of the Great Valley, the gradient lessens considerably. The gradient varies according to the permeability of the geologic materials and distance from the groundwater depression, from about 5 feet per 1,000 feet to about 30 feet per 1,000 feet, or 0.005 to 0.03.

The average linear velocity of groundwater flow may be estimated by the following form of Darcy's Law:

V = Ki/n

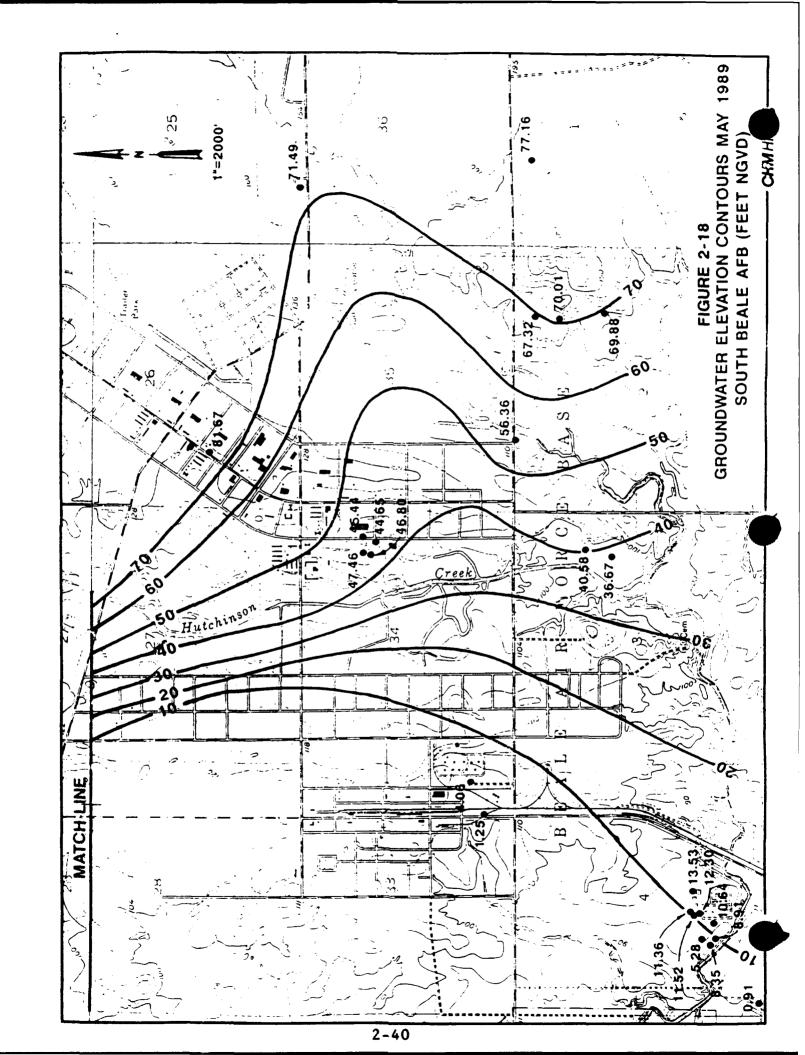
where:

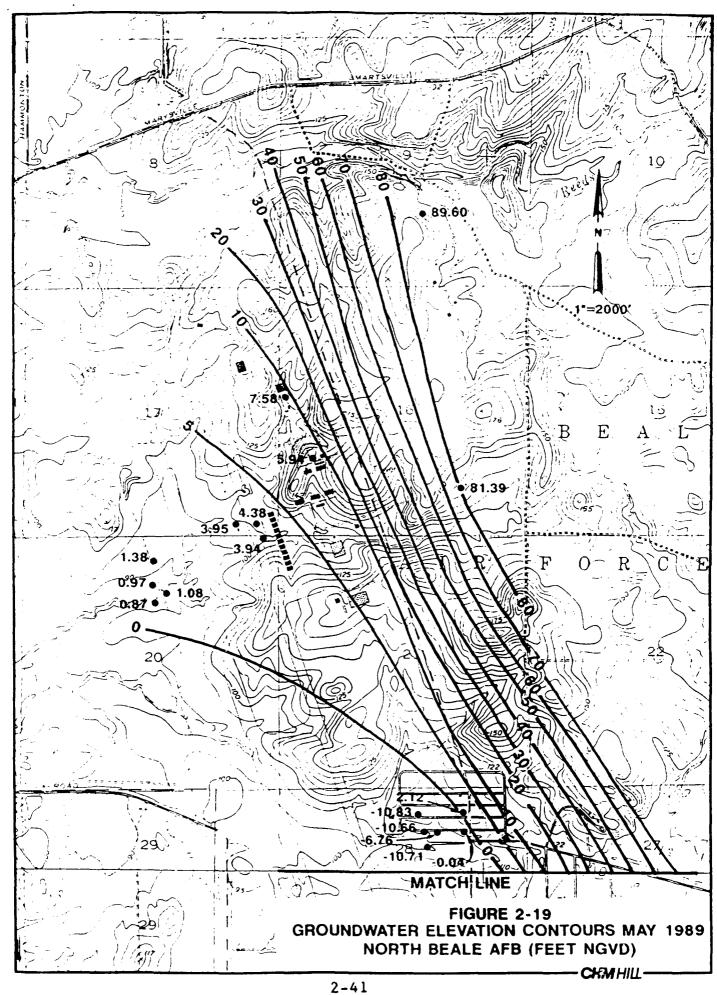
- V = Average linear velocity of groundwater flow (L/T)
- K = Hydraulic conductivity (L/T)
- i = Hydraulic gradient (L/L)
- n = Effective transport porosity (dimensionless)

Using the average hydraulic conductivity derived from the 72-hour pump test of 28 feet per day, the measured hydraulic gradient of 0.005 in the unconsolidated sediments, and an estimated effective transport porosity of 0.20, the approximate average velocity of groundwater movement at Beale AFB is about 0.7 feet per day, or 260 feet per year.

2.3.1.2 Groundwater Quality

Groundwater quality parameters were measured in monitoring wells at Beale AFB during the Stage 2-1 Remedial Investigation. Results of these analyses and related quality control data are presented in Appendices A and F. The following discussion is primarily based on these results.

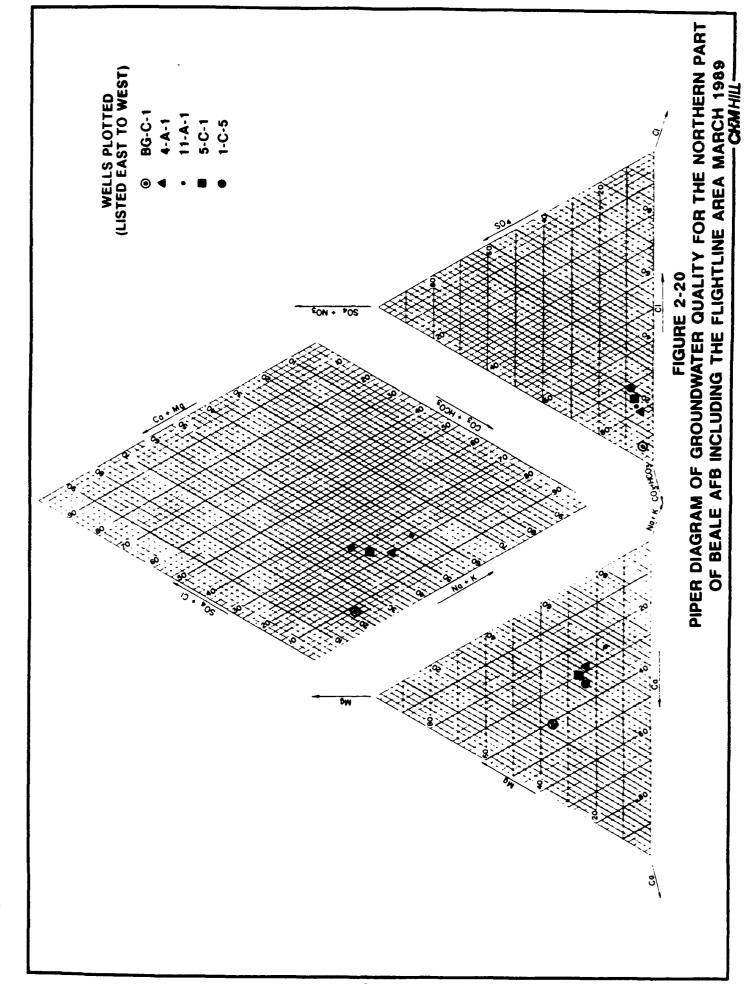




Natural water quality at Beale AFB is generally good, with base water supply wells (Page, 1980) and most monitoring well samples meeting national primary and secondary drinking water standards. Groundwater has been contaminated at some IRP sites and is discussed later in this report. In the uppermost permeable saturated zone in which monitoring wells are screened, total dissolved solids (TDS) ranged from 160 to 360 mg/l in the first sampling round, below the secondary drinking water standard of 500 mg/l. Groundwater quality at Beale AFB is discussed below, addressing the northern, central, and southern areas of the base separately.

Groundwater in the northern part of the base in the vicinity of the flightline (Sites 1, 4, 5, 11, 21, and background well I located east of Doolittle Drive) is recharged in large part by infiltration from the Yuba River just north of the base boundary. This groundwater is low in TDS (161 to 233 mg/l compared to the secondary drinking water standard of 500 mg/l). Nitrate is generally less than 10 mg/l ranging from 3.4 to 12.5 mg/l (nitrate plus nitrite is expressed as nitrate in this report). These values are higher than those for pristine groundwater but lower than those for other areas at Beale AFB. They are well below the national primary drinking water standard of 45 mg/l as nitrate. Sulfate levels were low in the first sampling round, being under 9 mg/l except at Site 21 (30.8 mg/l) and at a Site 1 downgradient well (1-C-3) (23.4 mg/1). However, by the third sampling round sulfate had dropped to 9.3 mg/l in 21-C-1 and 8.0 mg/1 in 1-C-3. These levels are all well below the 250 mg/l secondary drinking water standard. Chemical analyses from the first sampling round of representative wells in the northern part of Beale AFB are plotted on a Piper diagram (Figure 2-20). Groundwater type ranged from calcium-magnesium bicarbonate at background well 1 to sodium or sodium-calcium bicarbonate at the flightline. Groundwater at Sites 4, 5, and 11 all plotted close together on the Piper diagram. This indicates a similar recharge source for these wells, differing from background well 1, located 3,000 feet northeast of the flightline at a higher elevation.

Groundwater in the central part of Beale AFB (Sites 3, 18, 19, 23, and background well 2) is further from river recharge areas and may have a longer residence time, as suggested by the higher mineral content. In the first sampling round, the central area groundwater had higher TDS (260 to 385 mg/l) than in either the north or south areas. Nitrate was higher than the north area, possibly related to fertilizer or cattle grazing in the area or irrigation of the golf

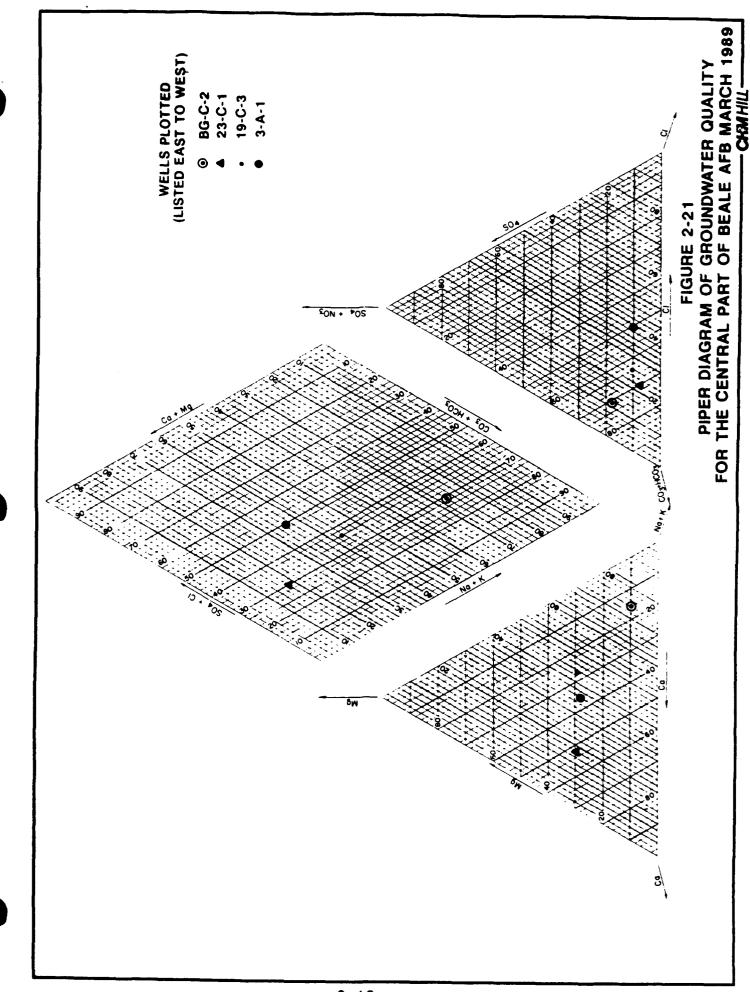


course with grey water from the sewage treatment plant. Nitrate ranges from less than 10 mg/l at Sites 3 and 18, to 16.3 mg/l at background well 2, to 23.4 mg/l at Site 23. Sulfates ranged from under 10 mg/l in the western part of Site 3, to 10 to 15 mg/l in the eastern part of Site 3, to about 15 to 25 mg/l at Sites 19, 23 and background well 2, to 30 mg/l at Site 18. Sulfate levels increased in the third sampling round at Site 3 to 10 to 20 mg/l and at Site 18 to 43 to 65 mg/l. Chemical analyses from the first sampling round from representative wells in the central part of Beale AFB are plotted on a Piper diagram (Figure 2-21). Groundwater type varied in the central area, ranging from sodium bicarbonate at background well 2, to calcium bicarbonate at Site 23, to sodium-magnesium bicarbonate at Site 19, to sodium or sodium-chloride bicarbonate at Site 18. significant pattern occurred on the Piper diagram except for an increase in chloride concentration moving east to west.

Groundwater in the southern part of Beale AFB (Sites 2, 6, 13, and 15) is recharged largely on base from infiltration from Dry Creek, Best Slough, and Hutchinson Creek; from precipitation east of the base; and to a lesser degree from the Bear River south of the base. In the first sampling round, TDS generally ranged from 192 to 292 mg/l except for anomalously high levels of 367 mg/l at a Site 6 downgradient well (6-A-1) and 435 mg/l at the background well at Site 2 (2-R-3). TDS levels were similar in later sampling rounds to TDS levels in the first round.

Nitrate was higher than in the north area, possibly related to fertilizer or cattle grazing in the area or irrigation of the golf course with grey water from the sewage treatment plant. Nitrate ranges from 5 to 12 mg/l at Site 15, from not detected to 17 mg/l at Site 6, and from 5 to 25 mg/l at Sites 2 and 13, near the sewage treatment plant. Sulfates range from 5 to 18 mg/l at Sites 15 and 6 except for the anomalously high value of 115 mg/l at downgradient well 6-A-2. At Sites 2 and 13, sulfate ranged from 11 to 48 mg/l except for the anomalously high 130 mg/l at background well 2-R-3. Nitrate and sulfate concentrations did not vary significantly in later sampling rounds.

Chemical analyses from representative wells in the southern part of Beale AFB are plotted on a Piper diagram (Figure 2-22). Groundwater type varied in the southern area, ranging from sodium and calcium-sodium bicarbonate at Site 15, to calcium-magnesium bicarbonate at Site 6, to mainly magnesium-calcium bicarbonate at Sites 2 and 13. No significant pattern or grouping of sites is apparent on the Piper



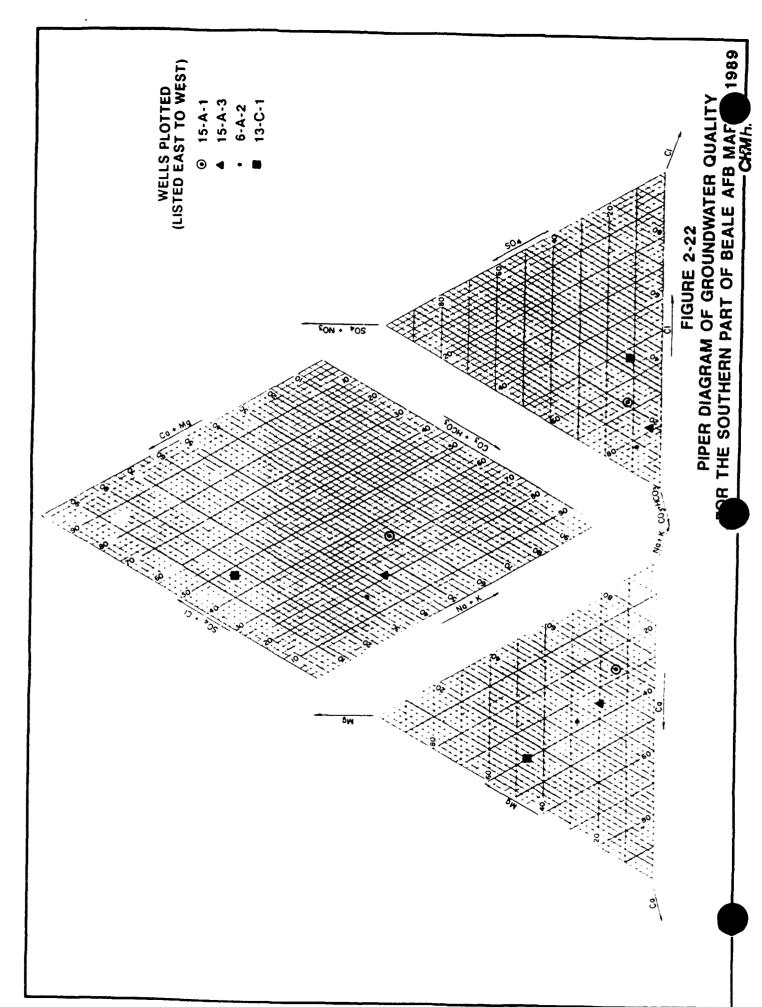


diagram except that magnesium increased and sodium plus potassium decreased moving from east to west.

Water from supply wells at Beale AFB is generally of good chemical quality and did not have organic chemicals detected in it during the IRP Phase II, Stage I investigation (Page, 1980 and AeroVironment, 1987). However, water from six base water supply wells exceeded the national secondary drinking water standard for manganese of 0.05 mg/l in 1975. Dissolved manganese is objectionable in water because it affects taste, stains plumbing, and accumulates as deposits in distribution systems (Page, 1980). Manganese was also present in off base agricultural and water supply wells.

2.3.1.3 Groundwater Uses

Groundwater is pumped to supply the military needs of the Air Force and the domestic needs of base residents. Downgradient from Beale AFB, groundwater is used mainly as agricultural irrigation, and to a lesser extent to supply the domestic needs of rural residents between the base and the pumping depression. In 1978, the USGS canvassed the wells in an area bounded by the Yuba, Feather, and Bear Rivers and the Sierra Nevada foothills on the eastern border of Beale AFB (Rockwell, 1978). Of the 752 wells listed in that report, about 75 percent or 565 wells were described as irrigation wells. About 10 percent, or 77 wells, were described as domestic wells. The remainder included public supply (39 wells), institution (2 wells), industrial (6 wells), and stock (8 wells). Fifty-five wells were listed as "unused" (Rockwell, 1978). It should be noted that a large number of these wells are not directly downgradient from Beale AFB. In addition, since 1978 new wells have been constructed and old wells have probably been abandoned or used for different purposes.

2.3.1.4 Well and Pump Maintenance

A study of monitoring well and pump maintenance was not undertaken as part of the Stage 2-1 investigation. In addition, installation of pumps was not part of this investigation. However, during sampling of wells installed during the previous Phase II, Stage 1 investigation, corrosion was noted at the junction of the screen and the riser casing, particularly at Site 5. These wells were constructed with stainless steel well screen and mild steel riser casing. Apparently, the contact of these dissimilar metals is causing dielectric corrosion.

2.3.1.5 Well Inventory

The locations of Beale AFB monitoring wells are shown on Plate 2, while the locations of the Beale AFB production wells are shown on Figure 2-11. An inventory of wells in the vicinity of Beale AFB was performed by the U.S. Geological Survey (Rockwell, 1978) and discussed above in Section 2.3.1.3. Wells in the vicinity of Beale AFB were plotted by Engineering Science (1984) as shown on Figure 2-23. An update of the well inventory was not conducted as part of the Stage 2-1 investigation. A discussion of construction details of monitoring wells installed during Stage 2-1 is provided in Section 3.5. Construction details of wells installed during Phase II, Stage 1 is available in AeroVironment (1987). Details of wells installed at the Photo Wastewater Treatment Plant (Site 2) are available in Radian (1985).

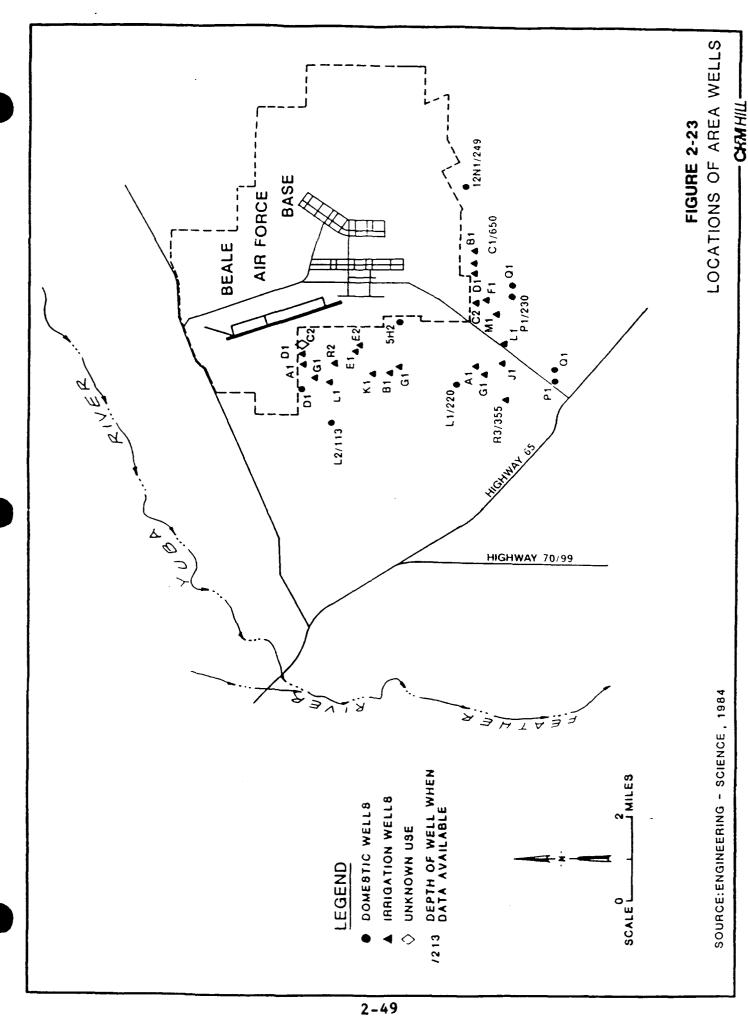
Groundwater levels are being monitored on a quarterly basis during the Stage 2-1 investigation. Appendix G contains data on groundwater levels in monitoring wells at Beale AFB. This appendix includes information on surveyed well head and ground surface elevations, depth-to-water and groundwater elevation data, and the screened intervals and total depths of each well. Soil boring logs kept for Stage 2-1 wells are available in Appendix D. Geophysical logging was not performed on any of the wells, nor were dedicated pumps installed.

2.3.2 SURFACE WATER

2.3.2.1 Occurrence and Flow

Surface water in the Sacramento Valley drains predominantly north to south and is eventually discharged westward, through the Carquinez Straits to the San Pablo Bay, San Francisco Bay, and the Pacific Ocean. The primary river within this drainage system is the Sacramento River.

At Beale AFB, drainage flows primarily from northeast to southwest, reflecting the surface topography in the area. The drainage comprises three main creeks and their tributaries: Dry Creek, Hutchinson Creek and Reeds Creek. Figure 2-24 illustrates the regional drainage in the vicinity of Beale AFB. Figure 2-25 shows the drainage on the base itself.



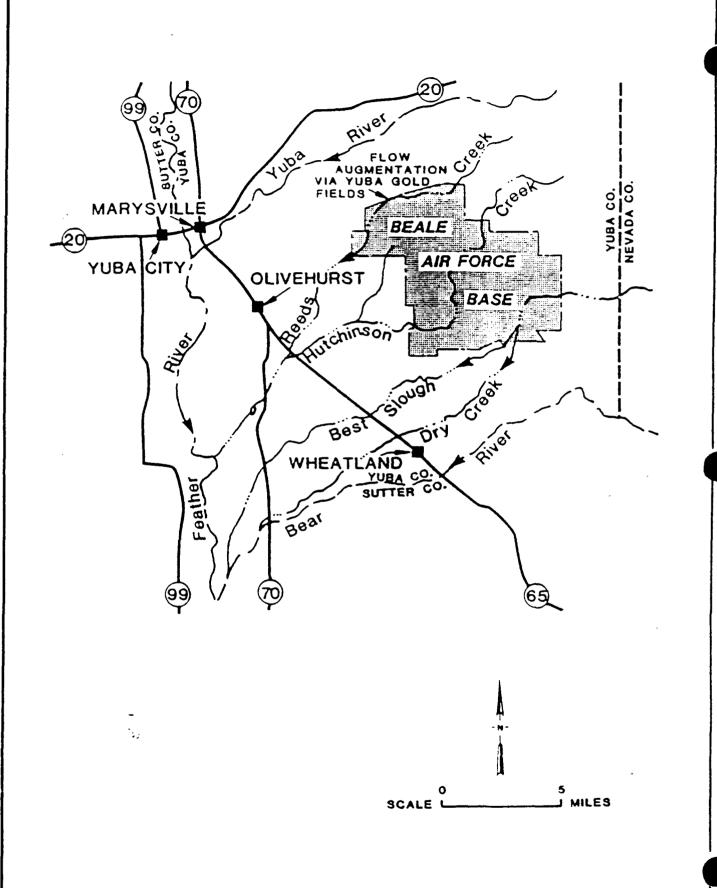
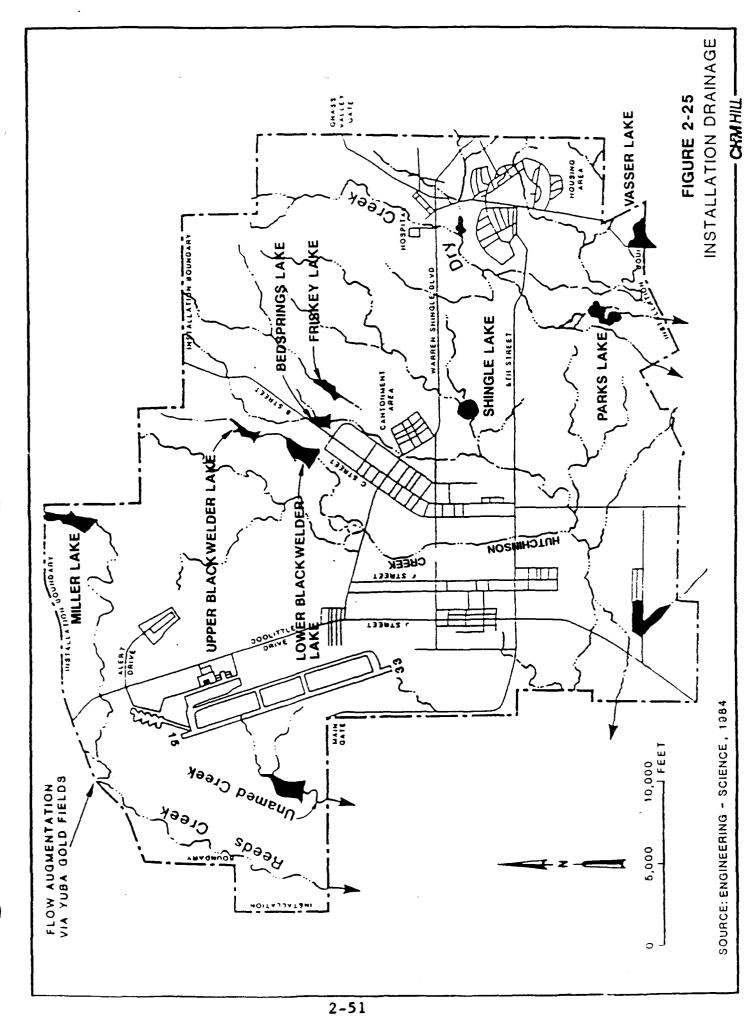


FIGURE 2-24
REGIONAL DRAINAGE

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Much of the runoff is conducted by numerous seasonal drainages—of the three main creeks, only Dry Creek in the southeast of the base normally flows all year. Because of the presence of locally impermeable clay substrates in the soil profile, vernal pools form over much of the base after winter rains. These pools and most of the creeks dry up in the summer. All of the creeks may provide recharge to the groundwater along certain reaches when they are flowing. Flows are not gaged in any of the streams at Beale AFB.

Dry Creek rises in the foothills about 10 miles east of Beale AFB and bifurcates into Dry Creek and Best Slough prior to leaving the base. Parks Lake and Vasser Lake are part of this system. In prehistoric times Dry Creek probably flowed into Hutchinson Creek (Raven et al, 1987). Today this drainage flows to the Bear River about 10 miles southwest of the base.

The cantonment area of the base is drained by Hutchinson Creek and its tributaries. Although this is the largest surface drainage system on the base itself, Hutchinson Creek flow is intermittent. Upper and Lower Blackwelder Lakes, Bedsprings Lake, Frisky Lake, and Shingle Lake are all part of this system.

Reeds Creek flows west along the northern base boundary from Miller Lake. Flows in Reeds Creek have been augmented at the northern base boundary from groundwater pumping discharges associated with dewatering of old hydraulic mine tailings being reworked by Yuba Gold Fields, Inc. along the Yuba River. The water from the gravel dewatering has been discharged to a canal that flows toward Reeds Creek at the base boundary. Opening and closing canal flap gates results in controlled releases of the canal flows to Reeds Creek. This flow augmentation scheme has been arranged by the Brophy Water District. Reeds Creek and Hutchinson Creek converge about 5 miles southwest of the base prior to flowing into Plumas Lake. The creek flows from this lake into the Feather River.

In addition to these main drainages, an unnamed creek east of Reeds Creek flows southwestward through Site 1, converging with Hutchinson Creek approximately 2 miles west of the base. This creek receives drainage from the flightline area and is known locally as the West Drainage Ditch where it flows through Site 1.

The Yuba River north of the base and the Bear River south of the base are tributaries to the Feather River. The Feather River flows south and converges with the Sacramento River at the Sutter County-Yolo County border.

2.3.2.2 Surface Water Quality

Water quality parameters were measured in surface water samples at Beale AFB (Figure 2-25) in the first quarterly sampling round of the Stage 2-1 Remedial Investigation. Results of these analyses and related quality control data are presented in Appendices A and F. The following discussion is primarily based on these results.

At the direction of the Air Force, upgradient surface water at Beale AFB was not sampled. Surface water was sampled at a tributary to Hutchinson Creek at Site 19, from a different tributary to Hutchinson Creek downstream from Site 6 and from Hutchinson Creek downstream of Site 13. Surface water was sampled at, and downstream, from Sire 1.

TDS varied from 69 to 169 mg/l in the Hutchinson Creek samples. Surface water type varied in Hutchinson Creek ranging from sodium-calcium bicarbonate at Site 19, to magnesium-calcium bicarbonate at Site 6, to sodium-magnesium bicarbonate at Sites 13. Surface water at the west side drainage ditch (Site 1) had TDS of 157 mg/l and was a calcium-sodium bicarbonate type.

2.4 AIR QUALITY

2.4.1 AMBIENT QUALITY

Air quality in the Beale AFB area (Yuba County) is generally good. Yuba County is classified nonattainment for the ozone standard, primarily due to long-range transport of pollutants from large metropolitan areas such as Sacramento and San Francisco. Until recently Tehama County was considered "unclassified" for total suspended particulates (TSP) because of the high level of natural fugitive dust. The area is now classified to be in attainment of the federal TSP standards, but is not in attainment of the state standards for particulate matter less than 10 microns in aerodynamic diameter (PM 10).

Agricultural burning, which occurs primarily in the fall, contributes to local visibility problems. Otherwise, there have been no serious air quality issues in the Yuba County area (McBride, 1987).

2.4.2 POLLUTION CHARACTERIZATION

Both ambient air quality and pollution characterization are assessed in terms of the EPA Classification for Yuba County:

- o Nonattainment for PM10 and ozone
- o Attainment for oxides of sulfur (SOx), oxides of nitrogen (NOx), and carbon monoxide (CO)

The Yuba County Air Pollution Control District oversees point sources that generate in excess of 25 tons of pollutants per year. Beale AFB, with its maintenance operations and power generation boilers, represents one of these point sources. Sources of area emissions include burning of agricultural wastes and application of pesticides and herbicides. The other major emission source category is mobile source emissions from motor vehicles and aircraft.

2.5 NATURAL RESOURCES

2.5.1 MINERAL RESOURCES

Beale AFB has no known mineral resources currently worthy of exploitation. However, the Yuba gold fields, north of the west side of the base, are presently mined.

2.5.2 ENVIRONMENTAL RESOURCES

Beale AFB has 1,000 acres classified as oak woodland dominated by the blue oak and digger pine with an understory of annual grasses. Fish and wildlife management account for 18,250 acres and include grazing leases which total 12,200 acres. The lease areas are open to hunting and fishing by authorized persons during regularly designated seasons.

A biological survey conducted by the U.S. Department of Agriculture in 1985 indicated that 8,579 acres of wetlands exist on Beale AFB. These wetlands are protected as a unique, valuable resource. They include 7,853 acres of vernal pools, 418 acres of riparian marshes, 98 acres of manmade ponds and reservoirs, and 210 acres of riparian forest (USDA, 1985b).

The saddle club area is 375 acres in size and is adjacent to a state-managed wildlife area which has several miles of trails available for horseback riding. Five picnic areas and one 2-mile nature trail are maintained (Beale AFB, 1986).

2.5.3 OTHER

Beale AFB has eucalyptus groves which are harvested for firewood. Several remnant European olive orchards exist within the base cantonment area. These orchards were established over 20 years ago and produce a variety of olive no longer in commercial demand (Beale AFB, 1986).

2.6 CULTURAL RESOURCES

2.6.1 ARCHAEOLOGY

Fourteen known archaeological sites have been confirmed at Beale AFB (Wirth Environmental Services, 1987). These sites include bedrock milling stations (grinding stones) and chipping stations associated with the Nisenan/Maidu Indians, and remnants of historical structures, roads, and mining sites associated with 19th and 20th century homesteads, farmsteads, and mining operations.

2.6.2 HUMAN RESOURCES

Information on human resources in the area, other than the archaeological and historical sites discussed, is not currently available.

2.6.3 HISTORICAL

Documentary research has identified historical activity at 108 locations on Beale AFB (Wirth Environmental Services, 1987). The majority of these are historical structures, roads, and mining sites associated with 19th and 20th Century homesteads, farmsteads, and mining operations. Immigrants to California in the early 1840s and 1850s were often attracted by the promise of gold. They traveled across the Sierras through Donner Pass and into the Sacramento Valley on their way to the Yuba gold fields north of Beale AFB. The last few miles of trail passed through what is now Beale AFB. Faint remains of this trail can still be found and traced through the grasslands of Beale. Settlement along creeks and rivers in and around Beale occurred as the influx of the '49ers increased. By late 1850, almost every ravine, gully, creek bed, and river along the western edge of the Sierras was being worked by miners. There is still evidence of excavations and mine shafts scattered about the rolling hills and flatlands of Beale. The legacy of the gold fields still remains at Beale where 200,000 tons of material from the Yuba River gold dredge piles were used as a base for streets during World War II.

Another historical site of interest is the World War II prisoner of war camp constructed when the base was known as Camp Beale. Approximately 3,000 German prisoners were held in the camp during the war. Today, remnants of the camps and other war-related activities include foundations from the cantonment area, the POW camp, machine gun emplacements, an infiltration course, and tank traps.

2.7 BIOLOGY AND ECOLOGY

2.7.1 COMMUNITIES AND HABITATS

Vegetation on Beale AFB is predominantly annual grasslands, grading into valley and foothill woodland in the eastern portion of the base. Hutchinson Creek, Dry Creek, and Reeds Creek flow through the base. Riparian vegetation occurs along these water courses and around lakes on the base.

The annual grasslands plant community is characterized by a sparse to dense mixture of herbaceous species, dominated by non-native annual grasses and forbs. Native perennial grasses have been reduced significantly in areas now leased for cropland and cattle grazing. Dominant grasses include Bromus spp.">Bromus spp., Avena spp., Elymus spp., and Festuca spp. <a href="https://docs.precent.org/Annual grasslands are typically found on flat or rolling terrain or on slopes not exceeding 15 percent. Woody vegetation is extremely sparse.

A unique plant community exists in low-lying topographic depressions that form vernal pools in the wet season when they fill with water. Characterized by a shallow cemented sediment, the soils have adapted to ephemeral wet conditions. In spring, characteristic concentric rings of blooming wildflowers signal a vernal pool plant community.

The valley and foothill woodland community, or Blue Oak Savanna, is dominated by the blue oak (Quercus douglasii), with an understory of non-native grasses and forbs. This community is typified by scattered oaks or rolling hills. A scattering of shrubs is also present.

Riparian vegetation along creeks and lakes is characterized by dense stands of oaks (Quercus spp.), ash (Fraxinus spp.), willows (Salix spp.), poplar and cottonwood (Populus spp.), elderberry (Sambucus spp.), and buckeye (Aesculus spp.). There is also an assortment of mint, rushes, and sedges.

Seven lakes on base property support a viable warm water fishery. Crappie (Pomoxis spp.), bass (Micropterus spp.), bluegill (Lepomis macrochirus), red ear sunfish (Lepomis microlophus), channel catfish (Ictalurus punctatus), and bullhead (Ictalurus spp) are found in all lakes, which experience heavy fishing pressure from base personnel.

The Dry Creek-Best Slough drainage also supports a warm water fishery. Dry Creek is perhaps more important for its fall/ winter run of chinook salmon (<u>Oncorhynchus tshawytscha</u>). Beale AFB recently constructed a fish ladder on Dry Creek near the southeast base boundary to enhance salmon migration.

The vegetative communities support a variety of wildlife species. Annual grasslands and vernal pools provide habitat for the California vole (Microtus californicus), the blacktailed jack rabbit (Lepus californicus) the Valley pocket gopher (Thomomys bottae), the badger (Taxidea tasus), the coyote (Canis latrans), the western meadowlark (Sturnella neglecta), and the horned lark (Eremophila alpesstris). During the wet season, vernal pools attract surface feeding waterfowl such as mallard (Anas platyrynchus), pintail (Anas acuda), and green-winged teal (Anas carolinensis), along with shorebirds such as killdeer (Charadrius vocifera), black-necked stilt (Himantopus mexicanus), and longbilled curlew (Numenius americanus). A large wintering and yearround, resident population of predatory birds also inhabits these plant communities. Species include the northern harrier kestrel (Falco spp.), the short-eared owl (Asio flammeus), the burrowing owl (Speotyto cunicularia), the redtailed hawk (Buteo jamaicensis), ferruginous hawk (Buteo regalis), barn owl (Tyto alba), great-horned owl (Bubo virginianus), and turkey vulture (Cathartes aura).

The woodlands are also inhabited by the aforementioned species. In addition, these areas support densities of nongame birds including (by common name) woodpeckers, sparrows, flickers, starlings, western fly catchers, and robins.

Lakes, ponds, and streams support a variety of wintering waterfowl such as Canada geese (<u>Branta canadensis</u>), whistling swan (<u>Olor columbianus</u>), cinnamon teal (Anas <u>cyanoptera</u>), widgeon (<u>Mareca americanus</u>), merganzers (<u>Mergus spp.</u>), western grebe (<u>Aechmosphorus occidentalis</u>), and ruddy duck (<u>Oxyora jamaicensis</u>). These areas also support populations of herons and egrets (by common name), and provide spring nesting on some sites.

Tall grass areas and drainages support a variety of upland game birds including quail (Lophortyx spp.), wild turkey (Meleagris gallopava), mourning dove (Zenaidura macroura), and ring-necked pheasant (Phasianus colchicus). These areas also provide habitat for an assortment of game and nongame mammals, including black-tailed deer (Odocoileus hemionus), skunk (Mephitis spp.), raccoon (Procyon lotor), tree squirrels (Sciurus spp.), ground squirrels (Citellus spp.), mink (Mustela vison), river otter (Lutra canadensis), muskrat (Ondatra zibethica), beaver (Castor canadensis), rabbits (Sylvilagus spp.), and bobcat (Lynx rufus).

2.7.2 ENVIRONMENTALLY SENSITIVE AREAS

Environmentally sensitive areas on Beale AFB include any habitat or foraging areas suitable for the endangered species discussed in the following subsection. Further, the acreages designated wetlands and vernal pools on the base would be considered environmentally sensitive areas.

2.7.3 ENDANGERED SPECIES

The California Natural Diversity Data Base reports that no endangered or threatened plant or animal species inhabit Beale AFB (Engineering-Science, 1984). The bald eagle (Haliaeetus leucocephalus) and the peregrine falcon (Falco peregrinus) use the base for winter and spring foraging, but there are no known nesting locations. Since two species of endangered raptors occur on the base on a seasonal basis, the base natural resources manager has initiated a routine raptor survey to document occurrences.

The Aleutian Canada goose (<u>Branta canadensis leucophareia</u>) has been sighted within a 50-mile radius of the base and has the potential to occur on base in the winter. At the publication of the Natural Resources Conservation report for Beale Air Force Base in 1985, there had been no recorded observations. However, base personnel continue to monitor for Canadian goose presence and coordinate with state and federal agencies.

Habitat suitable for a newly listed endangered species, the valley elderberry long horn beetle (<u>Desmocerus californicus dimorphus</u>), potentially exists in riparian and wetlands areas of the base. The U.S. Fish and Wildlife Service has expanded the range of the beetle north of the Marysville area and surveys are continuing (Kohl, 1989).

2.7.4 ECONOMIC SPECIES

Economic species at Beale AFB include both domestic agricultural species and fish and wildlife species. The Beale Range Management Plan established more than 14,000 acres of grazing and croplands on the base (Beale AFB, 1986). Cattle and horses are the predominant grazing animals.

Wildlife species available for hunting include deer, rabbits, doves, quail, pheasant, turkey, tree squirrel, and jack rabbit. Lakes are populated with bass, crappie, bluegill, sunfish, catfish, and bullhead. In addition, Dry Creek has been stocked with Chinook salmon.

2.8 CLIMATOLOGY/METEOROLOGY

The climate of Beale AFB, and the Central Valley is generally described as "interior" Mediterranean. Typical features of this climate are warm to hot, dry, cloudless summers and cool, wet winters.

Another characteristic common to the Central Valley is the frequent occurrence of temperature inversions, both at the surface and aloft. These inversions, most prevalent during periods of high pressure domination, tend to prevent the air below them from dispersing vertically, resulting in air stagnation and higher pollutant concentrations. During the winter months, strong inversions at or near the surface often contribute to the formation of ground, or "tule" fog. This fog usually forms at night and dissipates by midday, but sometimes these fogs persist for several days, filling the entire Sacramento Valley to a thickness of several hundred feet. During the months of November through February, for example, an average of 64 days with visibility less than 7 miles is reported at Beale AFB. Despite these occasional periods of fog, the area has an abundance of sunshine with an average of about 235 clear days a year in the valley.

2.8.1 PRECIPITATION

Annual precipitation fluctuates widely in California, with drought conditions followed by heavy rainfall years, and vice versa. In the valley, the mean annual rainfall ranges from about 18 to 25 inches. In the foothills and mountains, the mean annual rainfall increases rapidly from about 25 inches to more than 80 inches. The mean annual precipitation rate for the Beale AFB area is 23.1 inches, based on data from 1960 to 1985. Table 2-7 contains a summary of precipitation data for Beale AFB.

	Table	2-7	
PRECIP	ITATI	ON SU	MMARY

				Prec	ipitat	ion (i	nches,	1960-	1985)			
Yearly	<u>Jan</u>	<u>Feb</u>	Mar	Apr	May	<u>Jun</u>	<u>Jul</u>	Aug	<u>Sep</u>	<u>Oct</u>	Nov	<u>Dec</u>
Mean 23.1	4.1	3.4	3.1	1.8	0.4	0.2	0.1	0.1	0.4	1.5	4.1	3.2
Minimum 8.3	0.4	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Maximum 38.5	9.5	10.3	6.9	5.9	1.2	1.4	1.9	1.0	2.3	11.0	8.9	7.8
24-Hr. Maximum 3.5	2.9	3.5	2.5	2.2	1.1	0.7	1.8	0.4	2.0	5.5	3.2	2.1

Almost 95 percent of the rainfall at Beale AFB occurs during the period from October to April, when large-scale fronts progress inland from the Pacific Ocean. Snowfall at Beale AFB is rare and is more prevalent in the higher elevations to the east. During the summer months, precipitation at Beale AFB is virtually nonexistent, but convective thunderstorms periodically cause rain showers in the mountains to the east. The month with maximum precipitation is January, with an average of 4.1 inches. July and August, the driest months, both record averages of 0.1 inches.

Although a 5.5-inch, 24-hour rainfall occurred in October 1962, the USAF Technical Applications Center estimated the more typical 1-year, 24-hour rainfall event for Beale AFB would be 3.5 inches or less. This value may be used as an indicator of runoff and erosion and suggests moderate erosion and runoff potential. As shown in Table 2-7, 95 percent of the rainfall occurs during a 7-month wet season from October through April. During this period, rainstorms of moderate intensities occur frequently. Significant runoff occurs due to low permeability soils. However, the relatively low relief results in low to moderate erosion potential for most of the base.

2.8.2 TEMPERATURE

Mean winter temperatures (December through February) are in the upper-40s (degrees Fahrenheit), with typical daily lows near 40 and daily highs in the 50s. Winter extremes range from the 20s to near 80 degrees. The influence of the Pacific Ocean during the winter usually prevents severe cold episodes at Beale AFB. Mean summer temperatures (June through September) are in the 70s, with typical daily lows near 60 and daily highs in the 90s. Summer extremes range

from the high 40s to well over 100 degrees. An average of 17 days exceed 100 degrees each year. During spring and fall, mean temperatures are in the 50s and 60s, but can vary between winter- and summer-like patterns. Table 2-8 contains a summary of temperature data from Beale AFB.

Table 2-8 TEMPERATURE SUMMARY

			T	empe	ratui	re (°	F.	1959.	-1981	L)		
Yearly	<u>Jan</u>	<u>Feb</u>	Mar	Apr	May	<u>Jun</u>	<u>Jul</u>	Aug	Sep	<u>Oct</u>	Nov	Dec
Mean 62	46	51	54	58	67	74	79	77	74	64	53	45
Minimum 20	22	27	26	33	38	44	52	49	+2	36	29	20
Maximum 114	77	79	86	90	102	111	114	111	109	101	85	75

Source: Beale Air Force Base Installation Restoration Program Reports (Engineering Science, 1984; AeroVironment, 1987)

2.8.3 WIND

Wind direction, wind speed/velocity, seasonal variability, and evapotranspiration rates are discussed in the following sections.

2.8.3.1 Direction

The prevailing wind direction at Beale AFB is southerly. Winds generated either by approaching fronts or summertime heating in the valley typically enter the Sacramento Valley through the Carquinez Straits. Due to the geography of the valley, the westerly wind is deflected northward where it continues on to Beale AFB. In the summer, this wind brings cooler marine air. In the winter, however, this wind often is associated with a front bringing rain.

A secondary wind direction at Beale AFB is north-northwesterly. This wind is usually produced by a strong ridge of high pressure located off the coast of northern California. In the summer, this situation usually means very hot temperatures, as the ocean breeze is stifled. In the winter, this wind can become quite strong, and it usually means dry, clear, and cold conditions.

2.8.3.2 Wind Speed/Velocity

Overall, the winds at Beale AFB are generally light and average 4 miles per hour. The winds are strongest in the spring months and gentlest in fall.

2.8.3.3 Seasonal Variability

Table 2-9 contains a monthly listing of predominant wind directions and average wind speeds. The only month with a predominant wind direction other than southerly (or south-southeasterly) is December, with a predominant north-north-westerly wind direction.

Table 2-9 MONTHLY WIND SPEEDS AND DIRECTIONS 12/75-11/85

Annual	<u>Jan</u>	<u>Feb</u>	Mar	Apr	May	<u>Jun</u>	<u>Jul</u>	Aug	<u>Sep</u>	<u>Oct</u>	Nov	<u>Dec</u>
Wind Speed	4	5	5	5	5	5	4	4	4	3	4	4
Wind Direction	SSE	SSE	SSE	SSE	S	s	S	s	s	S	SSE	NNW
Source: AWS	Clin	natio	e Br	ief,	USAI	Tec	chnic	cal A	Appl:	icat:	ions	

2.8.4 EVAPOTRANSPIRATION

Center. February, 1986.

Specific data on evapotranspiration rates in the area are not available at this time. The annual evapotranspiration rate reported for the area is 66.5 inches and the average annual rainfall is 23 inches (Engineering Science, 1984). Ninety-five percent of all rainfall occurs during winter and spring months when evapotranspiration is relatively low.

November, December, January, and February are the only months with a net increase in soil moisture. Only about 11 inches of moisture infiltrate during this period before moisture begins to be removed during the dry season (Taylor, 1986).

III. FIELD INVESTIGATION PROGRAM

3.1 ORGANIZATION AND DEVELOPMENT OF THE FIELD PROGRAM

As discussed in Section 1 of this report, Phase I - Records Search and Phase II, Stage 1 - Confirmation and Quantification Study have previously been completed for Beale AFB. As a result of these studies, it was determined that additional investigations would be required to further define the nature and extent of contaminants at various sites within the base.

Development of this remedial investigation program (Stage 2-1) was initiated in September 1987, when the Air Force issued a delivery order to develop workplans for the remedial investigation (Contract F33615-85-D-4535, Delivery Order No. 0005). Draft workplans, including a Quality Assurance Project Plan (QAPP) and Site Safety Plan (SSP), were developed by CH2M HILL and delivered to USAFOEHL in January 1988.

After review and modifications by the Air Force, draft final versions of the plans were prepared and released in May 1988 to regulatory agencies for review and comment. Final versions of the plans were prepared as the first task of the RI delivery order (Delivery Order 0010 of the same contract) and were distributed in October 1988.

When the first draft versions of the plans were prepared, Stage 2 activities were to include remedial investigation (RI), feasibility study (FS), and risk assessment activities. As initial cost estimates were developed for the Stage 2 effort, the Air Force determined that insufficient funds were available in the current annual budget to accomplish all aspects of the project at once. For that reason, the Air Force modified the plans to include only RI activities and deferred planned activities at three of the 24 IRP sites. This modified program was termed Stage 2-1. Risk assessments, feasibility studies, and additional site investigations will be included in future activities, as necessary.

3.1.1 REMEDIAL INVESTIGATION

The RI program comprising Stage 2-1 includes activities at 19 sites, with sampling and analysis of 16 sites, geophysical investigation of 4 sites, and records search

activities for one site. Background sampling of groundwater, not directly associated with any particular site, was also included in the program.

In addition to the RI objectives of the IRP, several of the sites were also subject to State of California requirements under the Toxic Pits Cleanup Act (TPCA) and the Calderon Bill. Residual materials within the Photo Wastewater Treatment Plant (Site 2), the Fire Protection Training Area (Site 3) overflow basin, and the Sanitary Wastewater Treatment Plant Grease Pit (Site 20) required characterization to determine if they contain hazardous wastes and are, therefore, subject to TPCA.

The Photo Wastewater Emergency Holding Basin (Site 19) had already been declared by the Regional Water Quality Control Board to be subject to TPCA due to hazardous wastes present in the basin. The IRP site investigation included activities to support a hydrogeologic assessment of the site and the generation of a Hydrogeologic Assessment Report, as required by TPCA.

The three known landfills on base (Sites 6, 13, 15) were all subject to the Calderon Bill and, therefore, a Solid Waste Assessment Test (SWAT) was required for each site. Activities needed to meet the SWAT requirements were included in the IRP investigations at each site.

CH2M HILL has prepared the state-mandated reports in support of TPCA and Calderon as separate documents. These reports are not included in this IRP RI report. However, results from investigative activities in compliance with the state requirements also supported the remedial investigations at applicable sites and are therefore discussed as part of this report.

The level of remedial investigation conducted during Stage 2-1 at each site was dependent upon results of previous investigations, California regulatory requirements, and data requirements to support future feasibility studies. In most cases where contaminants were known to exist, additional sampling was conducted to confirm previous results, evaluate changes since the time of the last study, more accurately determine the nature of the contamination, and make a first estimate of the extent of the contamination. It was recognized that Stage 2-1 activities could not fully determine the extent of all contaminants in all media at all sites, primarily because of limited funds and USAF contracting constraints.

Remedial action activities accomplished at each of the IRP sites under Stage 2-1 are detailed in the Stage 2-1 Workplan (CH2M HILL, 1988a), the Stage 2-1 QAPP (CH2M HILL, 1988b), and the USAF Delivery Order No. 0010. The Delivery Order is included in Appendix B. Table 3.1.1-1 is a brief summary of RI activities, by site, completed during Stage 2-1. The number of sampling points and sample analyses, by site, is discussed in subsequent sections.

3.1.2 RISK ASSESSMENT

No risk assessment activities were completed as part of Stage 2-1 activities. Risk assessments will be conducted, as necessary, in future IRP stages.

3.1.3 FEASIBILITY STUDIES

No feasibility study activities were completed as part of Stage 2-1 activities. Feasibility studies will be conducted, as necessary, in future IRP stages.

3.2 DATA QUALITY OBJECTIVES

The EPA, in the March 1987 document <u>Data Quality Objectives</u> for <u>Remedia</u> Response Activities: <u>Volume 1 - Development Process</u>, defines data quality objectives as follows:

Data quality objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support Agency decisions during remedial response activities. DQOs are determined based on the end uses of the data to be collected.

DQOs are established prior to data collection and are not considered a separate deliverable. Rather, the DQO development process is integrated with the project planning process, and the results are incorporated into the sampling and analysis (S&A) plan, quality assurance project plan (QAPP) and, in general terms, into the work plan for the site. The DQO process results in a well thought out sampling and analysis plan which details the chosen sampling and analysis option and statements of the confidence in decisions made during the remedial process. Confidence statements are possible through the application of statistical techniques to the data (EPA, 1987a).

Table 3.1.1-1 SUMMARY OF ACTIVITIES FOR STAGE 2-1 REMEDIAL INVESTIGATION

	- Site	Activities			
1.	West Drainage Ditch	Sample and analyze culvert discharge and surface water in five locations quarterly.			
		Drill five new monitoring wells.			
		Sample and analyze new wells plus one existing well quarterly.			
		Sample and analyze ditch sedi- ments at 12 locations.			
2.	Photo Wastewater Treatment Plant, Injection Wells, and	Drill one new monitoring well.			
	Sludge Ponds	Sample and analyze new well plus five existing wells quarterly.			
		Drill two 50-foot angled borings at sludge ponds. Sample and analyze five samples from each.			
		Drill two 50-foot borings at injection wells 1 and 3, and one 25-foot boring at injection well 2. Sample and analyze five samples from each.			
		Drill one 50-foot boring at injection well 2. Sample and analyze eight samples from this boring.			
		Drill one background boring. Sample and analyze six samples from this boring.			
		Sample and analyze sludge pond sediment at six locations.			
		Sample and analyze eight surface soil locations.			
3.	Fire Protection Training Area	Drill one new monitoring well.			
	ALEA	Sample and analyze one new well and five existing wells semiannually.			
		Drill four 50-foot borings, two at the underground tanks and two angle borings under FPTA No. 2. Sample and analyze six samples from each.			

	Site	Activities
	·	Drill four 20-foot borings at FPTA 1. Sample and analyze five samples from each.
		Drill one 50-foot angled boring at the overflow basin. Sample and analyze five samples from this boring.
		Drill one 50-foot background boring. Sample and analyze six samples from this boring.
		Sample and analyze sediment in overflow pond at three locations.
4.	Battery Shop Dry Well	Sample and analyze existing well semiannually.
		Drill one 50-foot angle boring, then sample and analyze five samples from this boring.
5.	SR-71 Shelter Drainage Area	Sample and analyze runoff from shelter area at two locations.
		Drill one new monitoring well.
		Sample and analyze new well and one existing well semiannually.
		Drill three 50-foot borings. Sample and analyze six samples each.
		Drill one 50-foot background boring. Sample and analyze six samples for this boring.
		Sample and analyze surface soil at five locations.
6.	Landfill No. 2	Sample and analyze one surface water location in Hutchinson Creek quarterly.
		Drill one new monitoring well.
		Sample and analyze the one new well and two existing wells quarterly.

Table 3.1.1-1 (Continued)

	Site	Activities
		Drill four 60-foot angled borings. Sample and analyze six samples from each.
		Drill one 50-foot background boring. Sample and analyze three samples from this boring.
7.	Army Biological Production Area	Prepare a No Further Action Decision Document to reflect determination of no further action.
8.	J-57 Test Cell	No site investigation during Stage 2-1 activities.
9.	Entomology Building 2560	Drill one 20-foot boring. Sample and analyze five samples from this boring.
10.	J-58 Test Cell	No site investigation during Stage 2-l activities.
11.	Aircraft Ground Equipment Maintenance Area	Sample and analyze one existing well semiannually.
		Drill three 10-foot borings. Sample and analyze two samples from each.
12.	Entomology Building 440	Prepare a No Further Action Decision Document to reflect determination of no further action.
13.	Landfill No. 1	Sample and analyze surface water in Hutchinson Creek at one location quarterly.
		Drill six new monitoring wells.
		Sample and analyze new wells and two existing wells quarterly. One new was sampled only in the third and fourth rounds.
		Drill four 60-foot angled borings. Sample and analyze six samples from each.
		Drill one 50-foot background boring. Sample and analyze five samples from this boring.

Table 3.1.1-1 (Continued)

	Site	Activities
14.	Transformer Drainage Pit	No site investigation during Stage 2-1 activities.
15.	Landfill No. 3	Sample and analyze four existing monitoring wells.
		Drill four 60-foot angled bor- ings. Sample and analyze six samples from each.
		Drill one 50-foot background boring. Sample and analyze five samples from this boring.
		Conduct emissions screening over middle acre of landfill.
		Install five landfill vapor monitoring wells. Sample and analyze vapors from one well. Monitor remaining four wells with OVA.
		Conduct a 24-hour, downwind ambient air test. Collect and analyze air sample.
16.	Explosive Ordnance Disposal	Drill one new monitoring well.
	Area	Sample and analyze new well quarterly.
		Sample and analyze surface soil at three locations in pit.
		Conduct geophysical survey to determine whether other trenches exist.
17.	Best Slough	Conduct geophysical survey to determine whether buried drums are present.
18.	Bulk Fuel Storage Facility	Drill two new monitoring wells.
		Sample and analyze new wells semiannually.
		Drill three 10-foot borings. Sample and analyze three samples from each.
		Sample and analyze surface soil at 33 locations.

Table 3.1.1-1 (Continued)

	Site	Activities
		Sample and analyze ditch sediment at three locations.
19.	Photo Waste Emergency Hold- ing Basin	Sample and analyze surface water at one location quarterly.
		Drill two new monitoring wells west of holding basin and one new background monitoring well east of holding basin.
		Sample and analyze three new wells quarterly.
		Drill one new pumping well and sample it in the second, third, and fourth sampling rounds.
		Drill two 50-foot angled borings. Sample and analyze five samples from each.
		Drill one 50-foot background bor- ing. Sample and analyze five samples from this boring.
		Sample and analyze six surface soil samples from three locations.
		Conduct a 72-hour aquifer test.
20.	Grease Pit	Drill one 50-foot angled boring. Sample and analyze five samples from this boring.
		Sample and analyze soil sediment at three locations.
		Conduct geophysical survey to determine whether other pits exist between wastewater treatment plant and Landfill No. 1.
21.	JP-7 Aboveground Fuel Stor-	Drill one new monitoring well.
	age Tanks (Flightline)	Sample and analyze new well semiannually.
		Sample and analyze surface soil at five locations.

Table 3.1.1-1 (Continued)

	Site	Activities
22.	Abandoned Underground Storage Tanks	Prepare an underground storage tank (UST) base map and review all available drawings of construction to update suspected tank locations.
		Determine a representative area on base with approximately 10 percent of suspected tank locations for future investigation.
		Conduct geophysical survey to locate suspected tanks.
23.	Ninth Transportation	Drill one new monitoring well.
	Refueling/Maintenance Shop	Sample and analyze new well in the first and fourth sampling rounds.
		Drill four 20-foot borings. Sample and analyze five samples from each.
24.	Landfill No. 4	Determine location, dimensions, and operating history by conducting a records search of documents provided by base officials.
25.	Installation Background	Drill two new monitoring wells.
	Sampling	Sample and analyze new wells quarterly.
		Background soil borings were drilled at Sites 2, 3, 5, 6, 13, and 15 as noted above. Samples were taken and analyzed in each boring.

EPA has described a three-stage process for DQO development. These stages are shown in Figure 3.2-1. All of these components were accomplished during the development of the project work plan (CH2M HILL, 1988a) and QAPP (CH2M HILL, 1988b). Figure 3.2-2 lists these components of the DQO process and corresponding sections in the work plan or QAPP where items are addressed.

3.2.1 IDENTIFICATION OF DATA USERS

The first step in the DQO process is to identify and involve data users. EPA divides data users into primary and secondary categories. Primary data users are defined as "those individuals involved in the ongoing RI/FS activities. These activities include RI/FS planning and implementation, project management and oversight, site-specific decision making, and DQO development" (EPA, 1987a). Primary data users typically include site owners, federal or state lead agencies, and contractor personnel.

EPA describes secondary data users as those who "rely on RI/FS outputs to support their activities. Secondary data users provide input to the decision maker and primary data users by communicating generic or site specific data needs. Depending on project lead, secondary data users may include the state, enforcement personnel, the Agency for Toxic Substances and Disease Control (ATSDR), U.S. Army Corps of Engineers, and others. The level of involvement of secondary data users will vary according to site-specific requirements, program lead, or Agency policy" (EPA, 1987a).

Primary and secondary data users for this project are listed below. Only one contact at each organization is listed. It is the responsibility of these contacts to distribute data to other personnel within their organization.

PRIMARY USERS

USAFHSD

Sam A. Taffinder Technical Program Manager HSD/YAQI Brooks AFB, TX 78235-5501 512/537-5501

STAGE 1

IDENTIFY DECISION TYPES

IDENTIFY & INVOLVE DATA USERS
EVALUATE AVAILABLE DATA
DEVELOP CONCEPTUAL MODEL
SPECIFY OBJECTIVES/DECISIONS

STAGE 2

IDENTIFY DATA USES/NEEDS

IDENTIFY DATA USES

IDENTIFY DATA TYPES

IDENTIFY DATA QUALITY NEEDS

IDENTIFY DATA QUANTITY NEEDS

EVALUATE SAMPLING/ANALYSIS OPTIONS

REVIEW PARCC PARAMETERS

STAGE 3

DESIGN DATA COLLECTION PROGRAM

ASSEMBLE DATA COLLECTION COMPONENTS
DEVELOP DATA COLLECTION DOCUMENTATION

* PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, COMPARABILITY

FIGURE 3.2-1

DQO THREE-STAGE PROCESS

- CHEM HILL-

DQO COMPONENTS

APPLICABLE LOCATIONS

STAGE 1 IDENTIFY DECISION TYPES

DEVELOP CONCEPTUAL MODEL ______ WORK PLAN - SECTION 1.2.2

SPECIFY OBJECTIVES/DECISIONS _____ WORK PLAN - SECTION 2.2

WORK PLAN - SECTION 2.2

WORK PLAN - SECTION 4.4

QAPP - SECTION 1.4

STAGE 2

IDENTIFY DATA USES/NEEDS

IDENTIFY DATA USES

IDENTIFY DATA TYPES

IDENTIFY DATA QUALITY NEEDS

IDENTIFY DATA QUANTITY NEEDS

EVALUATE SAMPLING/ANALYSIS OPTIONS

WORK PLAN - SECTION 4.4

REVIEW PARCC*PARAMETERS ______ \int work Plan - Section 4.4 QAPP - Section 1.4

STAGE 3

DESIGN DATA COLLECTION PROGRAM

ASSEMBLE DATA COLLECTION COMPONENTS ______ WORK PLAN - SECTIONS 5 & 7

DEVELOP DATA COLLECTION DOCUMENTATION _____ QAPP (VARIOUS SECTIONS)

* PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, COMPARABILITY

FIGURE 3.2-2 LOCATION OF DQO COMPONENTS WITHIN THE WORK PLAN AND QAPP

----- **CHM** HILL--

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Environmental Engineer

HQ SAC/DEVC

Offutt AFB, NE 68113-5001

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SECONDARY USERS

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Dick Procunier

U.S. Environmental Protection

Agency

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Beale AFB

Public Affairs

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Capt. Antonio Ronquillo 9SRW/PA Beale AFB, CA 95903 916/634-2137

3.2.2 IDENTIFICATION OF DATA USES AND NEEDS

Data needs for the individual IRP sites at Beale AFB have been detailed in the Work Plan and QAPP. Table 3.1.1-1 (previously given) summarizes the actions which were taken at each site to meet the data needs.

In general, DQOs were developed to include data uses and needs by evaluating the following criteria:

- o Data uses--What will the collected data be used for?
- o Data types--What sample types, media, chemical analyses, and physical parameters need to be evaluated?
- o Data quality--What degree of confidence (quality) must be accomplished?
- o Data quantity--How many samples and tests will be required?
- o Sampling/analysis options--Which sampling/analysis scheme(s), such as one-time or phased sampling, will be needed?
- o PARCC parameters--Definition of precision, accuracy, representativeness, completeness, and comparability parameters for tests and analyses.

Data uses, for the Stage 2-1 RI, are primarily to support site characterization including definition of the nature and extent of contamination and status of sites with respect to meeting ARARs. It is anticipated that, in the future, data

generated in Stage 2-1 will additionally be used to support risk assessment and evaluation of alternatives.

Data types generated in Stage 2-1 included information about contaminant sources, transport routes, receptors, and background conditions. Media sampled included wastes, soils, sediments, surface water, groundwater, and air. Chemical analyses were specific to individual site data needs, but generally included metals, organics, fuel hydrocarbons, water quality parameters, and various site-specific analyses. Physical testing was primarily limited to aquifer tests to determine flow and storage properties and standard penetration testing of soils.

To develop the sampling and analysis approach used in Stage 2-1, a preliminary ARARs evaluation was conducted during the workplan development task. Based upon this evaluation of chemical-specific and location-specific ARARs, analyses were selected that had detection limits suitable for meeting these ARARs. For example, the GC methods 8010 and 8020 for purgeable aromatics and halocarbons were selected for water analyses, in place of the GC/MS method 8240, because the GC methods had lower detection limits capable of meeting State of California Action Levels.

During Stage 2-1 activities, the preliminary ARARs evaluation was expanded into a more detailed evaluation based on contaminant analytes detected. This ARARs evaluation is included as Appendix I.

Data quality for Stage 2-1 involved Level 1 (field screening), Level 2 (field analysis), and Level 3 (standard laboratory analysis). Field screening was primarily limited to visual inspection of sample media and organic vapor analyzer "sniffing". Field analysis included water quality testing for pH, specific conductivity, temperature, and alkalinity. All remaining analyses were conducted by standard laboratory methods.

Data quantity varied from site to site dependent upon results of previous studies (if any), and anticipated data uses.

Sampling and analysis options generally involved either onetime sampling and analysis, as with soils and sediments, or phased sampling, as with surface water or groundwater. Water samples were collected either quarterly or semiannually dependent upon contaminant levels expected and proximity of individual sites to potential receptors.

PARCC parameters have been detailed in the QAPP, especially with respect to acceptable limits for analytical precision (relative percent difference), accuracy (percent recovery), and completeness.

3.3 IMPLEMENTATION OF THE FIELD PROGRAM AND SUMMARY OF FIELD WORK PERFORMED

A field program to accomplish goals outlined in the Stage 2-1 Workplan, QAPP, and SSP was initiated in October 1988. Environmental media at 16 sites were sampled, analyzed, and interpreted. Two of these sites, plus two additional sites, underwent geophysical investigation. A records search was conducted for one site. Four quarterly water sampling rounds were completed in 1989. All field methods were consistent with procedures in USAF-HSD Technical Services Division Handbook to Support the Installation Restoration Program (IRP) Statements of Work for Remedial Investigation/Feasibility Studies Version 2.0 (April 1988) and the Statement of Work. The following describes the time sequence for the field program and the role of the subcontracting firms.

3.3.1 TIME SEQUENCE OF WORK PERFORMED

The time sequence of Stage 2-1 remedial investigation field activities is given in Table 3.3.1-1.

Surface soil sampling began on November 15, 1988, and continued until December 21. Soil borings were drilled from November 30, 1980 until January 18, 1989. Drilling and installation of the wells proceeded from November 29, 1988 through January 11, 1989. Development of the wells followed installation of each well head surface monument (concrete pad) after allowing a minimum of 72 hours to provide adequate curing of the monument and cement-bentonite grout seal. Well development occurred from Lecember 5, 1988, to January 25, 1989. Aquifer tests were conducted starting on January 26 and ending on March 22, 1989. Water level readings taken prior to the first quarter water sampling round were taken February 2 to 7, 1989. On February 13, 1989, the first quarter water sampling round began and lasted through April 4. The subsequent rounds were conducted in May, August, and November 1989.

Resampling of some soil samples occurred on January 6, January 19 through 25, and May 2 and 3, all in 1989. Some water resampling occurred on March 18, 19, and 20, 1989.

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	ACTIVITY	2	9						-	B					
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	SURFACE SOIL SAMPLING														
	SOIL BORING DRILLING AND SAMPLING														
	MONITORING WELL DRILLING AND INSTALLATION												-		
· · · · · · · · · · · · · · · · · · ·	WELL DEVELOPMENT														
	PUMP TESTS														
3-17	QUARTERLY WATER SAMPLING														
7	GEOPHYSICS														
	AIR SAMPLING														

TABLE 3.3.1-1
TIME SEQUENCE OF STAGE 2-1
REMEDIAL INVESTIGATION FIELD ACTIVITIES

- CHEMHILL -

Resampling occurred due to laboratory analysis holding times being exceeded or analysis quality not meeting contract specifications. This is further discussed on a site-by-site basis in Section IV.

Air sampling was conducted at Site 15 from May 11 through May 17, 1989. The geophysical investigations at Sites 16, 17, 20, and 22 were conducted April 24 through May 5, 1989.

3.3.2 IDENTIFICATION AND ROLE OF SUBCONTRACTORS

For field work carried out in Stage 2-1 activities, CH2M HILL employed two California subcontractors: Layne Environmental Services of Fontana and Diamond Core Drilling of Palo Cedro.

Layne Environmental Services drilled, installed, and developed all groundwater monitoring wells and assisted in aquifer testing and groundwater sampling. They also performed some of the cleanup of the work areas after drilling at the sites.

Diamond Core Drilling drilled both vertical and angled soil borings to collect samples and allow development of boring log records. Additionally, Diamond Core constructed the five soil vapor monitoring wells at Landfill No. 3 (Site 15).

3.4 INVESTIGATION METHODS AND SURVEYS CONDUCTED INCLUDING TYPES OF INSTRUMENTATION USED

3.4.1 GEOPHYSICAL INVESTIGATION

The sites that underwent geophysical investigation were Site 16, the Explosive Ordnance Disposal (EOD) area, Site 17, Best Slough; Site 20, the Grease Pit (including Site 13, Landfill No.1); and Site 22, Abandoned Underground Storage Tanks (selected locations).

3.4.1.1 Objectives

Explosive ordnance is disposed in a trench at Site 16. The ground appears disturbed in the vicinity of the trench. The objective of the investigation was to determine if other trenches were used in this area in the past and to identify their locations.

There are four trenches of various dimensions at Site 17, Best Slough. Three of the four contain from 10 to 40 rusted

55-gallon drums. The geophysical investigation at Best Slough was to determine if any metal objects indicative of additional drums could be detected in the vicinity of these trenches.

Behind the Grease Pit at Site 20, there is a long trench, and the soil surface in the area appears very uneven. A magnetometer survey was conducted in this area to help locate metal objects that could be indicative of any buried trenches.

A geophysical investigation was also conducted in areas where underground tanks from Camp Beale had been located. Current estimates place the original number of underground tanks at about 75). The purpose of this investigation was to investigate a "representative" 10 percent of these locations in order to give an indication of the total number of Camp Beale WWII vintage tanks that may still be in the ground. A magnetometer survey was conducted at the locations of 82 tanks of various sizes in the cantonment area, the WWII barracks area between Doolittle Drive and Warren Shingle Boulevard and D and F Streets, and the WWII hospital area.

3.4.1.2 Equipment

Because ground-penetrating radar cannot be used effectively in areas where the soil is moist and contains a high percentage of clay, magnetometry was determined to be the most reliable method to meet the objectives listed above. An EDA Omni Plus gradiometer was used for the survey. This instrument simultaneously measures both the total magnetic field and the vertical gradient.

3.4.1.3 Procedure

The procedure for evaluating the presence of an underground tank consisted of setting up a small grid on a tank-by-tank basis. The grid was comprised of three lines 60 feet long and 10 feet apart, and centered on the tank location as specified by the 1944 Camp Beale maps. When an anomaly was located at the edge of the grid, the grid was extended to include the entire anomaly.

Measurements were made of both the total magnetic field as well as the vertical gradient at all the grid points. In most cases the vertical gradient was used to supplement the total field data, and most of the data presented in Section IV is based upon total field data.

The procedure used for Sites 16, 17, and 20 was quite different from that for the underground tank investigation. Magnetic characterization of these sites involved surveying large areas, whereas the tank investigation required surveying only the small area close to tank locations on the 1944 Camp Beale Maps. For these large areas, a grid was set before taking measurements. At Site 20, and during the first day at Site 17 (east of the fence), the line spacing was 20 feet, with a station spacing of 10 feet, yielding a grid with rectangles 20 feet on one side and 10 on the other. At Sites 16 and 17 during the second day (west of the fence), the line spacing was expanded to 40 feet except near the trenches. The lines ran generally north-south. Individual magnetometer profiles along the grids are provided in Appendix H.

3.4.1.4 Interpretation

Different investigation objectives for Sites 16, 17, and 20, as contrasted with the underground tank sites, led to the application of different interpretation methods in these two cases.

3.4.1.4.1 Sites 16, 17, and 20

Measurements over these sites were made on grids that covered relatively large areas. The objectives were to identify and delineate waste burial sites. The following procedures were performed to evaluate the data.

Contour maps of the total field intensity were generated and are presented with each site discussion in Section IV. The contour maps were used to highlight anomalous features and show their approximate extent and orientation.

Profile plots were generated to show the magnetic intensity along each survey line. These plots are presented in Appendix H. These plots were used to identify anomalies and to interpret the location of the source of each anomaly. Some anomalies identified in the profiles were too small to affect the contour map. The source locations are estimated to extend from the magnetic high on the south side of the source to the low on the north side.

An interpretation map showing the location of buried metal was prepared for each of the locations interpreted from the profiles.

3.4.1.4.2 Site 22 Underground Abandoned Tanks

The purpose of this investigative work was to develop a methodology to locate tanks and to assess a representative subset of the abandoned tanks on base. Small grids, consisting generally of three survey lines, were established over the suspected tank locations. The data were not contoured except as needed to help understand non-characteristic anomalies.

Profile plots of the data were prepared for only one line per grid, and are presented in Appendix H. The line selected generally had the strongest anomaly and was assumed to be the line nearest the source.

If an anomaly indicative of buried metal that was interpreted to be a buried tank was present on the profile plot, the location of the tank was estimated. A tank was interpreted to be present if the anomaly indicated a shallow, isolated metal object of limited extent. This interpretation was based on visual appearance of the anomaly, and not on any quantitative assessment of the data. Magnetometer data cannot be used to distinguish buried tanks from other buried metal. For the purposes of this study, it was assumed that if buried metal was identified where a tank is supposed to be, then it was a tank.

If the presence of a buried tank was uncertain after review of the profile plot, a contour map of the magnetic intensity was made. The contour map was used to determine if the anomaly extent was consistent with a body the size of a tank. The contour maps are not included in this report. Excavations performed at several possible underground tank locations are discussed in Section 4.1.22.3. The results of the Site 22 geophysical investigation are summarized in Table 4.1.22-1.

3.4.2 SOIL GAS INVESTIGATION

The purpose of the soil gas investigation was to determine the extent of landfill gas migration through both soil and air. Four different tests were performed at Site 15 (Landfill No. 3): emissions screening, a downwind ambient air test, a landfill gas test, and a landfill gas migration test. All tests were conducted in compliance with the California Air Resources Board testing guidelines for active solid waste disposal sites (CARB, 1986). The results of all soil gas investigations are discussed in Section 4.1.15.1.3.

3.4.2.1 Emissions Screening

The purpose of the emissions screening was to detect emissions of organic compounds from the landfill surface soil cover.

Emissions screening consisted of two steps. The organic vapor background concentration was first measured upwind from the landfill with an organic vapor analyzer (OVA). The OVA inlet probe was held 10 feet above the ground surface for 1 minute and the OVA reading was recorded. This reading was used as the background value for comparison with the landfill measurements. Second, the approximate center acre of the landfill was screened for organic vapors with an OVA. The OVA was carried across a 25-foot grid pattern. The OVA inlet probe was held 2 to 3 inches above the landfill cap during testing. Points of vapor emissions above 50 ppm were plotted on a map of the site and are presented in Section IV.

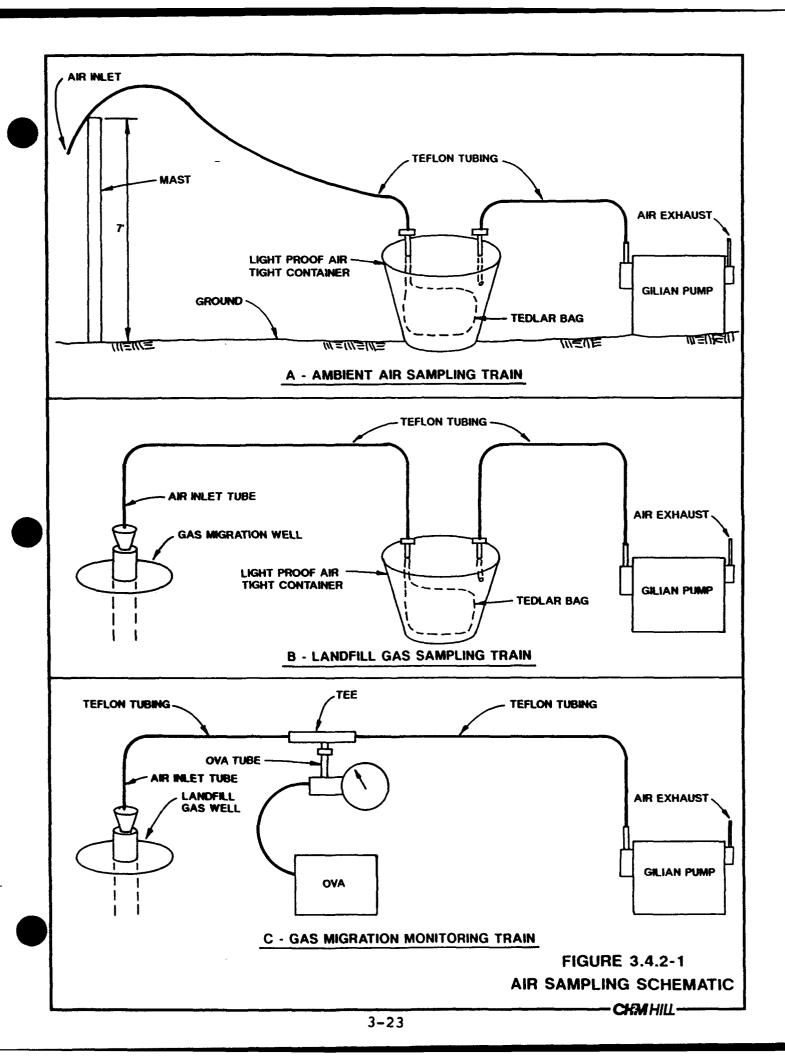
3.4.2.2 Downwind Ambient Air Testing

The downwind ambient air test was conducted to characterize the organic vapors present in the air downwind of the landfill. This phase of air monitoring consisted of collecting a 30-liter air sample downwind of the landfill over a period of 24 hours.

Before sampling, the Beale AFB weather station was contacted to obtain prevailing wind velocity and a 24-hour weather forecast. The ambient air sampling train, illustrated in Figure 3.4.2-lA, was placed approximately 100 feet downwind of the landfill, 7 feet above the ground surface. Three consecutive 8-hour samples were collected. A Gilian personal sampling pump was used to control the air flow into the Tedlar sampling bags. One 10-liter Tedlar bag was collected during each 8-hour sampling period. Each Tedlar bag remained in a light-proof container during and following sample collection. At the conclusion of the 24-hour period, the three 10-liter Tedlar bags were shipped in light-proof boxes to a laboratory for analysis.

3.4.2.3 Landfill Gas Testing

To characterize any landfill gas generated, a soil vapor monitoring well was installed in a soil capped landfill trench. The soil vapor monitoring well was constructed by drilling a 4-inch-diameter hole with a Mobile B-53 truck-mounted drill rig. A 1-inch-diameter galvanized steel pipe



was installed in the hole to complete the vapor well. The bottom 18 inches of the pipe were slotted at 1-inch intervals on alternating sides of the pipe. The slots were approximately .25-inch wide. A threaded, galvanized steel cap covered the bottom of the pipe. A sand pack (Monterey No. 3 sand) was placed in the annulus between the borehole and the pipe to fill the space from the bottom of the vapor well to approximately 6 inches above the highest slot. A cement-bentonite grout mixture was placed above the sand to the ground surface. The galvanized steel pipe was steam-cleaned before well construction. Figure 3.4.2-2 schematically illustrates the well completion detail.

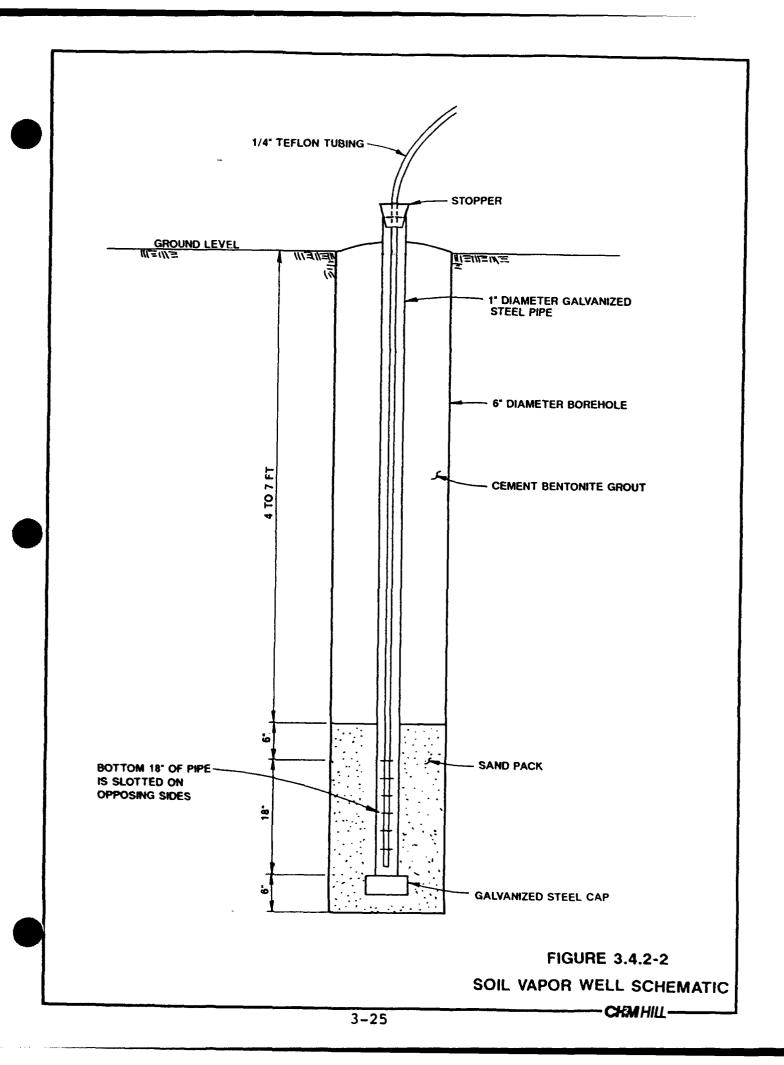
The soil vapor monitoring well was installed on May 4, 1989, and sampled 7 days later. Prior to sampling, the well was purged of three to five well volumes of air with a Gilian sampling pump. After purging, a 10-liter air sample was drawn from the well into a Tedlar bag at the rate of 1 liter per minute. Figure 3.4.2-1B shows the sampling train used for landfill gas collection. The Tedlar bag was kept in a light-proof container during sampling and shipping. The sample was shipped to a laboratory for analysis.

3.4.2.4 Gas Migration Testing

The purpose of the gas migration testing phase was to determine the extent of landfill gas migration, if any, through the ground from the landfill. Four soil vapor monitoring wells were constructed, one on each side of the landfill. A Mobile B-53 truck-mounted drill rig was used to construct the vapor wells. Each well was completed through hollowstem augers to a depth of approximately 8 feet below the ground surface. The four vapor wells were similar to the vapor well used for landfill gas testing. The wells were purged of three to five well volumes of air with a Gilian pump using the sampling train for gas migration monitoring shown in Figure 3.4.2-1C. Air being drawn from the wells was monitored with an OVA via an access point in the tubing between the well head and pump intake. Purging continued until a stable OVA reading was reached. In accordance with CARB guidance (CARB, 1986), air samples from the four perimeter vapor wells were not collected and analyzed.

3.4.3 GEOTECHNICAL AND ENGINEERING INVESTIGATION

No geotechnical or engineering investigations were performed as part of Stage 2-1 activities except for blow counts during soil boring sampling for lithology and chemical analyses. Blow counts are recorded on soil boring logs in



Appendix D. Geotechnical and engineering investigations will be conducted, as necessary, in future IRP stages.

3.4.4 SURVEYING AND PERMANENT FIELD IDENTIFICATION OF ALL SAMPLING LOCATIONS

The measuring point elevations of the new monitoring wells and borehole sampling locations were determined by survey and recorded to the nearest 0.01 foot (vertical control). The measuring point on monitoring wells was marked by a notch on the north side of the steel riser casing. Elevations were based on U.S. Corps of Engineers (USCE) Benchmark (BM) 131-318 and BE 131-40. In addition, the horizontal coordinates of these wells were determined relative to the State Plane Coordinate System. Horizontal coordinants were based on Cox and Casey U.S. Coast and Geodetic Survey (USC & GS) control points. The surveys were performed by qualified surveyors (Anthony Cruse, Thomas Dale, and Neal Jones) under the supervision of a licensed land surveyor (Gary Dobson, California Land Surveyor No. 4796). Survey equipment was used, operated, and calibrated in accordance with the manufacturer's recommended procedures. Instrumentation used included a Wild T-1000 Theodolite, Wild DI-5S EDM (Electronic Distance Measuring Device), and Wild NA-2 Level. Table 3.4.4-1 lists well and soil boring locations, and elevations for well casing (steel protective casing), PVC casing, and native ground (ground surface). The "point" column presents the point numbers assigned during electronic data collection.

Wells and boreholes are identified by a code consisting of the site number, followed by a letter designating the firm that installed the borehole or well, followed by the number of the borehole or well by that firm at that site. For example, 2-C-4SB indicates a Site 2 borehole installed for CH2M HILL which is the fourth borehole installed at Site 2 for CH2M HILL. In the survey data, SB indicates a soil boring and GW indicates a monitoring well. In the results section GW is dropped for monitoring wells. Monitoring wells were installed for CH2M HILL (C) in this Stage 2-1 investigation, by AeroVironment (A) in the Phase II, Stage 1 investigation, and by Radian (R) in an earlier investigation at Site 2.

Table 3.4.4-1
WELL AND SOIL BORING LOCATIONS

•		•			vations	
Location	Point ^a	Northing	Easting	Casing	_TPVC ^b _	NG°
1-C-1SS THRU 3SS	185 -	537400.07	2157865.55			85.95
1-C-4SS THRU 6SS	184	537551.97	2158080.67			86.41
1-C-7SS THRU 9SS	183	537668.53	2158283.48			87.46
1-A-1GW	178	537688.95	2158368.97	94.18	93.87	92.34
1-C-1GW	177	538108.65	2158387.86	95.46	94.68	93.16
1-C-2GW	182	537618.52	2158281.19	92.40	91.95	89.89
1-C-3GW	181	537612.24	2158288.80	92.27	92.13	90.18
1-C-4GW	180	537704.88	2158273.46	92.74	92.27	89.78
1-C-5GW	179	537710.25	2158283.99	93.09	92.22	89.99
2-C-1SB	147	519745.33	2163416.85			92.41
2-C-2SB	156	518476.70	2161496.59			86.30
2-C-3SB	157	517653.10	2161490.87			83.80
2-C-4SB	158	517677.22	2161465.72			83.61
2-C-5SB	149	519056.87	2163633.32			97.49
2-C-6SB	148	518992.67	2163508.80			95.88
2-C-7SB	154	517453.64	2164043.17			84.74
2-C-7BSB	155	517450.68	2164040.61			88.46
2-A-1GW	79	517647.31	2161486.95	86.16	85.65	83.58
2-C-1GW	159	517647.31	2161486.95	86.31	85.12	83.46
2-R-1GW	61	519033.14	2163438.82	93.41	93.10	92.57
2-R-2GW	62	519096.42	2163465.96	94.05	93.72	93.13
2-R-3GW	80	519091.43	2163877.91	96.84	96.60	95.39
2-R-4GW	60	518857.33	2163521.34	95.59	95.38	94.34
3-C-1SB	127	532748.73	2165045.84			111.43
3-C-2SB	121	532363.28	2164739.47			103.99
3-C-3SB	122	532342.48	2164733.91			103.50
3-C-4SB	126	532515.78	2164849.47			107.83
3-C-5SB	132	532366.57	2164524.46			104.19

Table 3.4.4-1 (Continued)

Location	Point	Northing	Easting	Casing	evations TPVC ^b	NG°_
3-C-6SB	125	532527.26	2164777.57			107.83
3-C-6BSB	124	532528.74	2164778.59			107.89
3-C-7SB	123	532393.96	2164724.60			104.38
3-C-8SB	120	532381.91	2164763.49			104.22
3-C-9SB	134	532587.94	2164513.14			106.54
3-C-10SB	133	532510.91	2164499.02			106.88
3-A-1GW	128	532840.58	2165054.53	114.86	114.50	112.02
3-A-2GW	129	532488.28	2165062.73	108.74	108.45	106.75
3-A-3GW	135	532241.17	2164324.03	103.10	102.47	101.00
3-A-4GW	131	532467.60	2164281.40	107.27	106.73	103.08
3-A-5GW	136	532751.52	2164081.53	105.74	105.55	105.53
3-C-1GW	130	532437.06	2164490.17	108.78	107.51	105.59
4-C-1SB	171	540314.93	2161876.45			119.87
4-A-1GW	170	540292.73	2161867.22	119.30	118.97	119.25
DRY BAT-	170	5/0205 /5	0141070 51			
TERY WELL	172	540325.45	2161872.51			120.79
5-C-1SB	162	538510.26	2160901.48			113.59
5-C-2SB	161	538758.02	2160818.05			112.11
5-C-3SB	160	538953.83	2160753.57			110.74
5-C-4SB	165	539131.32	2161521.00			115.40
5-A-1GW	163	538958.24	2160656.66	108.71	108.45	108.47
5-C-1GW	164	538627.10	2160760.63	110.42	109.60	110.21
6-C-1SB	81	522866.93	2171669.96			115.32
6-C-2SB	82	522707.87	2172373.72			122.13
6-C-3SB	84	521575.97	2172583.62			113.83
6-C-4SB	83	521494.39	2171786.74			118.01
6-C-5SB	85	520541.96	2171582.69			109.84
6-A-1GW	87	521696.73	2171142.00	101.56	100.97	99.48
6-A-2GW	86	520913.84	2170820.75	100.24	99.64	98.70
6-C-1GW	88	522900.47	2173251.74	110.96	110.78	108.49
8-A-1GW	180	543460.50	2160627.57	156.91	156.65	156.85

Table 3.4.4-1 (Continued)

T	n	•• . 1 .	_	Elevations		
<u>Location</u>	Point'	Northing	Easting	Casing	TPVC ^b	NG°
9-C-1SB	146	530867.20	2174058.49			129.18
10-A-1GW	101 -	539819.02	2164940.41	140.84	140.56	140.59
11-C-1SB	173	541655.58	2161272.11			124.61
11-C-2SB	175	541675.09	2161317.45			124.51
11-C-3SB	176	541800.56	2161278.47			127.64
11-A-1GW	174	541639.67	2161288.12	126.10	125.58	124.21
13-C-1SB	74	518234.51	2163107.47			89.11
13-C-2SB	65	518725.93	2162800.20			88.52
13-C-2BSB	66	518716.48	2162798.75			88.47
13-C-3SB	63	518705.39	2163123.55			92.25
13-C-3BSB	64	51870037	2163119.97			92.22
13-C-4SB	75	518522.40	2163115.00			91.12
13-C-4SBA	76	518507.14	2163096.59			89.48
13-C-4SBB	77	518477.69	2163097.60			89.62
13-C-5SB	72	518456.69	2162846.69			89.16
13-A-1GW	68	518695.75	2162557.54	89.35	88.94	86.90
13-A-2GW	71	518447.38	2162729.87	88.58	88.22	86.66
13-C-1GW	67	518776.35	2162738.56	91.73	90.37	88.19
13-C-2GW	70	518533.63	2162680.51	88.53	88.01	85.84
13-C-3GW	69	518541.94	2162692.80	88.22	87.51	85.51
13-C-4GW	73	518368.54	2162827.16	90.92	90.20	87.81
13-C-5GW	78	518413.41	2163224.83	95.57	94.47	92.45
15-C-1SB	196	522234.99	2177789.58			181.01
15-C-2SB	190	522618.55	2176497.39			141.60
15-C-3SB	195	522157.90	2178731.93			165.72
15-C-4SB	197	521828.25	2178323.18			179.81
15-C-5SB	194	522775.76	2177193.62			144.07
15-A-1GW	198	522544.37	2179046.96	171.23	170.75	168.89
15-A-2GW	191	522546.99	2175856.73	136.40	136.00	133.24
15-A-3GW	192	521819.18	2175839.76	137.46	136.71	135.01

Table 3.4.4-1 (Continued)

				E	Elevations		
Location	Point ^a	Northing	<u>Easting</u>	Casing	TPVC	NG°	
15-A-4GW	193	521267.44	2176116.71	141.72	141.07	139.63	
16-C-3SB	150	538611.87	2174108.48			171.07	
16-C-1GW	152	538771.41	2173803.64	162.43	161.03	159.36	
ABAND.WL	151	538720.45	2173850.26			161.69	
18-C-1SB	110	524540.03	2166801.24			117.15	
18-C-2SB	111	524528.96	2166642.64			117.12	
18-C-3SB	112	524525.50	2166519.05			117.36	
18-C-1GW	114	523306.28	2165435.32	113.89	112.71	110.82	
18-C-2GW	113	523803.46	2165977.57	117.33	115.84	114.07	
19-C-1SB	105	526112.34	2171066.82			111.25	
19-C-2SB	104	526046.98	2171022.17			110.66	
19-C-3SB	101	525866.34	2171010.38			109.63	
19-C-1GW	106	526056.34	2171208.55	114.87	114.28	114.54	
19-C-2GW	103	526016.80	2170889.50	116.13	116.17	112.99	
19-C-3GW	102	525886.95	2170888.65	114.83	114.28	112.17	
19-C-4GW	100	525767.84	2171098.14	112.73	111.39	109.07	
20-C-1SB	51	518746.30	2163253.14			94.99	
21-C-1GW	166	538981.89	2160167.50	105.55	103.52	102.20	
23-C-1SB	140	529444.47	2173087.36	1		127.46	
23-C-2SB	143	529348.89	2173093.90	2		129.58	
23-C-2BSB	144	529347.62	2173095.81	3		129.61	
23-C-3SB	145	529306.03	2172974.65	4		127.43	
23-C-4SB	142	529266.72	2172883.31	5		122.91	
23-C-1GW	141	529294.54	2172948.27	6 128.06	126.99	127.76	
BG-C-1GW	202	545496.67	2164123.88	171.54	171.11	169.22	
BG-C-2GW	201	527526.32	2178530.28	163.54	162.19	159.98	

^{*}Point is the number electronically assigned during field work. TPVC is top of polyvinyl chloride casing. *NG is natural ground surface.

3.5 DRILLING AND BOREHOLE PROGRAM

3.5.1 NUMBER OF WELLS AND BOREHOLES INSTALLED

A total of 26-new wells and 52 boreholes were installed during Stage 2-1. They are described and listed by site in Table 3.1.1-1 (given previously) and summarized by site in Table 3.5.1-1.

3.5.2 FOOTAGE SUMMARY

Table 3.5.2-1 summarizes soil boring footages completed at Beale AFB during Stage 2-1. Similarly, Table 3.5.2-2 lists the footages for groundwater monitoring wells installed during Stage 2-1.

3.5.3 DRILL RIGS AND DRILLING TECHNIQUES USED

3.5.3.1 Soil Borings

Boreholes were advanced by continuous flight $3\frac{1}{4}$ -inch-inside-diameter hollow-stem augers. The vertical borings were drilled with a Mobile B-80 truck-mounted drill rig, and the angled borings with a Mobile B-53 truck-mounted drill rig. Angle borings were all drilled at a 30 degree angle from vertical. Boring and sample depths in angle borings in this report are listed as distance along the borehole with the actual vertical depth following in parentheses. For angle borings the vertical depth below ground is approximately 0.87 times the depth down the borehole.

After blocking plug, auger flights, and interior had undergone decontamination procedures outlined in Section 2.4.6 of the QAPP (CH2M HILL, 1988b), the auger and blocking plug were advanced to the depth at which a sample was to be collected. The sample was collected in accordance with ASTM Method D-1586. Between samples, the materials encountered during drilling were recorded on soil boring logs throughout drilling activities. Organic vapors were also monitored and recorded. Cuttings from soil borings and monitoring wells were not drummed unless visual inspection, odor, or organic vapor monitoring indicated contamination. Soil cuttings were stockpiled on plastic sheeting during drilling, and have been disposed of under the direction of the base environmental engineer, Kirk Schmalz, P.E., in accordance with Section 2.0 of the QAPP and applicable regulations (CH2M HILL, 1988b).

MONITORING WELLS, SOIL BORINGS, AND HAND AUGERINGS STAGE 2-1

Site <u>Number</u>	MonitoringWells	Soil <u>Borings</u>	Hand <u>Augerings</u>
1	5	0	12
2	1	7	14
3	1	10	3
4	0	1	0
5	1	4	5
6	1	5	o
9	0	1	0
11	0	3	o
13	6	5	0
15	0	5	0
16	1	0	3
18	2	3	36
19	4	3	3
20	0	1	3
21	1	0	5
23	1	4	0
Background Wells	2	0	0
			_
Total	26	52	84

Table 3.5.2-1
FOOTAGE SUMMARY FOR SOIL BORINGS AT BEALE AFB
STAGE 2-1

<u>Site</u>	Boring	Date	Depth (ft.)	No. of Samples
2 2 2 2 2 2 2 2	2-C-1SB 2-C-2SB 2-C-3SB 2-C-4SB 2-C-5SB 2-C-6SB 2-C-7SB	12/05/88 12/05/88 12/07/88 12/08/88 12/20/88 12/21/88 12/02/88	51.5 51.5 51.5 28.0 49.0 50.0 51.5	5 8 5 5 5 6
3 3 3 3 3 3 3 3	3-C-1SB 3-C-2SB 3-C-3SB 3-C-4SB 3-C-5SB 3-C-6SB 3-C-7SB 3-C-7SB 3-C-9SB 3-C-9SB	12/12/88 12/12/88 12/13/88 12/13/88 12/14/88 12/14/88 01/04/89 01/05/89 01/11/89 01/12/89	51.5 21.5 21.5 51.5 48.5 51.5 21.5 21.5 49.0 49.0	6 5 5 6 5 5 6 6
4	4-C-1SB	01/17/89	49.0	5
5 5 5 5	5-C-1SB 5-C-2SB 5-C-3SB 5-C-4SB	01/09/89 01/10/89 01/11/89 01/12/89	51.5 51.5 51.5 52.0	6 6 6
6 6 6 6	6-C-1SB 6-C-2SB 6-C-3SB 6-C-4SB 6-C-5SB	12/01/88 12/12/88 12/08/88 12/12/88 12/09/88	51.5 59.0 59.0 58.0 59.0	3 6 6 6
9	9-C-1SB	12/09/88	21.5	5
11 11 11	11-C-1SB 11-C-2SB 11-C-3SB	12/09/88 12/16/88 01/13/89	10.1 7.8 12.3	2 2 2
13 13 13 13	13-C-1SB 13-C-2SB 13-C-3SB 13-C-4SB 13-C-5SB	12/06/88 12/15/88 12/14/88 01/04/89 12/16/88	51.5 59.0 59.0 59.0 59.0	5 6 6 6

Table 3.5.2-1 (Continued)

<u>Site</u>	Boring	Date	Depth (ft.)	No. of Samples
15	15-C-1SB	12/01/88	63.5	6
15	15-C-2SB	12/06/88	59.0	6
15	15-C-3SB	12/05/88	59.0	6
15	15-C-4SB	12/07/88	59.0	6
15	15-C-5SB	11/30/88	51.5	5
18	18-C-1SB	01/03/89	13.0	3
18	18-C-2SB	01/03/89	11.5	3
18	18-C-3SB	01/03/89	11.5	3 3
19	19-C-1SB	12/08/88	51.5	5
19	19-C-2SB	12/13/88	48.5	5
19	19-C-3SB	01/05/89	50.0	5
20	20-C-1SB	01/10/89	49.0	5
23	23-C-1SB	12/20/88	21.5	5
23	23-C-2SB	12/20/88	21.5	5 5
23	23-C-3SB	12/19/88	21.5	5
23	23-C-4SB	12/21/88	21.5	5
Totals	52		2214.2	268 ^b

^{*}Total footage Total samples

Table 3.5.2-2
FOOTAGE SUMMARY FOR GROUNDWATER MONITORING WELLS
AT BEALE AFB, STAGE 2-1

<u>Site</u>	Well Number	Date <u>Drilled</u>	Total Depth	Screened <u>Interval</u>
1 1 1 1	1-C-1 1-C-2 1-C-3 1-C-4 1-C-5	12/02/88 11/29/88 12/01/88 12/01/88 12/02/88	111 146 110 140 110	86-106 120-140 85-105 115-135 85-105
2	2-C-1	12/05/88	170	145-165
3	3-C-1	12/13/88	138	113-133
5	5-C-1	12/15/88	129	104-124
6	6-C-1	12/05/88	90	65-85
13 13 13 13 13	13-C-1 13-C-2 13-C-3 13-C-4 13-C-5 13-C-6	12/09/88 12/07/88 12/08/88 12/06/88 12/07/88 08/07/89	120 150 110 105 117 108	95-115 125-145 85-105 80-100 92-112 83-103
16	16-C-1	01/11/89	39	14-34
18 18	18-C-1 18-C-2	12/09/88 12/12/88	134 130	109-129 105-125
19 19 19 19	19-C-1 19-C-2 19-C-3 19-C-4	12/14/88 12/12/88 12/08/88 01/04/89	104.5 101 110 148	79.5-99.5 65-85 75-95 83-143
21	21-C-1	12/15/88	139	104-124
23	23-C-1	12/14/88	79	45-65
Background Wells	BG-C-1 BG-C-2	12/08/88 12/14/88	99 109	74-94 84-104
Totals	26		3046.5	560°

^{&#}x27;Total footage 'Total screen length

Cuttings suspected of being hazardous based on field screening during drilling were drummed on site. Drummed cuttings were disposed of under the direction of the Environmental Branch at Beale AFB. Thirty-six barrels of drummed drill cuttings were delivered to the Base Hazardous Waste Storage Facility; 25 of these barrels were disposed of as hazardous waste solid, N.O.S. Disposal was done through the Defence Reutilization and Marketing Office (DRMO), McClellan AFB, Ca. Barrels disposed of through DRMO consisted of soil from borings 3-C-2SB, 3-C-3SB, 3-C-4SB, 3-C-6SB, 3-C-6BSB, 3-C-8SB, 3-C-10SB, 18-C-18SB, and 18-C-3SB. The remaining 11 barrels were disposed of at the Beale AFB landfill (Site 15). On November 15, 1989, an agreement was reached between Thomas Hultin, Beale AFB, and Sue Yea, California Regional Water Quality Control Board (CRWQCB), to use the Base landfills for disposal of those barrels with a total fuel hydrocarbon value of less than 400 ppm. The barrels disposed of in the landfill consisted of soil from borings 3-C-5SB, 3-C-10SB, and 23-C-2SB. Cuttings that showed no indication of being hazardous at the time of drilling using field screening techniques were stored on plastic at the drill sites until analytical results confirmed they were not hazardous. These cuttings were then spread out at the drill site.

At the sampling depth, the blocking plug was removed and replaced with a 2.5-inch I.D. California modified splitspoon sampler. The sample was taken by driving the sampler using a standard 140-pound slide hammer operated on a wire line. Blow counts were recorded for each 6 inches of sampler penetration. The sampler was then removed and drilling continued to the next sampling depth. The split spoon sampler was opened and the three 2.5-inch-diameter by 6-inchlong brass sampled sleeves were removed by CH2M HILL person-The ends of the sleeve were immediately covered with Teflon sheets and capped with tight fitting plastic caps, and sealed with electrical tape. The sleeves were placed in zip-lock plastic bags and immediately stored in an ice chest at approximately 4°C. Sample preservation is discussed in Section 3.6.3. When the maximum depth of the borehole was reached, the auger was removed and the borehole was grouted to the surface with a bentonite-cement slurry. All augers and equipment used below the ground surface were then decontaminated. Typically the top of the grout settled several feet within a day of grouting. Where this occurred, the boreholes were topped off to the ground surface with additional grout.

3.5.3.2 Monitoring Wells

Monitoring wells were installed by Layne Environmental Services using the reverse circulation dual-tube percussion hammer technique with a Drilling Systems AP-1000 drill rig. This drilling method was selected because wells drilled using air develop more quickly than wells drilled using mud, particularly in low permeability formations such as those often encountered in the uppermost aquifer at Beale AFB. This method returns cuttings up to 6 inches in diameter to the ground surface through a discharge hose and cyclone separator. Cuttings drop continuously from the cyclone separator onto plastic sheeting, allowing continuous sampling and permitting logging of the depth to soil contacts, perched groundwater zones, and the groundwater table, or the uppermost groundwater-producing zone when this zone occurs under confined conditions. This method also allows a rough estimate of the ultimate yield of the monitoring well and of the aquifer properties, based upon the sediments collected and the amount of water produced during drilling.

The wells were drilled to a depth of about 20 feet below the dry season water table. Wells were screened with the screen covering the uppermost saturated permeable zone. All equipment used down hole was decontaminated by steam cleaning between uses (as described in Section 2.4.6 of the QAPP: Equipment Decontamination) to prevent cross contamination between boreholes. Organic vapors were monitored as described in Section 2.4.3 of the QAPP. For well drilling activities, drill cuttings were not drummed because visual inspection, odor, and organic vapor meter readings did not indicate contamination. All monitoring well cuttings not drummed have been disposed of under the direction of the base environmental engineer in accordance with Section 2 of the QAPP (CH2M HILL, 1988b).

3.5.4 WELL DESIGN AND WELL CONSTRUCTION DETAILS

The groundwater monitoring wells were completed with 4-inch-inside-diameter Schedule 40 PVC casing installed in a bore-hole approximately 10 inches in diameter. The screened interval consists of 20 feet of Johnson wire-wrap type 304 stainless steel screen in either 0.020-inch or 0.010-inch slot size (see well logs in Appendix D). A 5-foot type 304 stainless steel blank was installed below the screen to serve as a sediment trap. Monterey No. 3 sand was used for the gravel pack, and a bentonite seal was placed approximately 5 feet above the screened interval. A No. 30 silica

sand seal above the bentonite separated the cement-bentonite grout from the bentonite seal. Cement-bentonite grout was placed from the top of the silica sand to ground surface. The surface completion was either a steel protective casing set in a 2 x 2-foot x 4-inch concrete pad with approximately 3 feet of stick-up or a ground surface completion using a concrete vault set in a cement pad, as specified in the QAPP (CH2M HILL, 1988b). Figure 3.5.4-1 presents a schematic of well construction details.

Construction details for each well are shown in the monitoring well logs in Appendix D.

Following construction, the wells were developed for a minimum of 2 hours each by bailing, surging with a surge block, or pumping until the water flowed free of visible turbidity and suspended sediments. In this way, the natural hydraulic properties of the aquifer were restored. Water levels in the wells were measured during development to gain a preliminary understanding of the yield of the well.

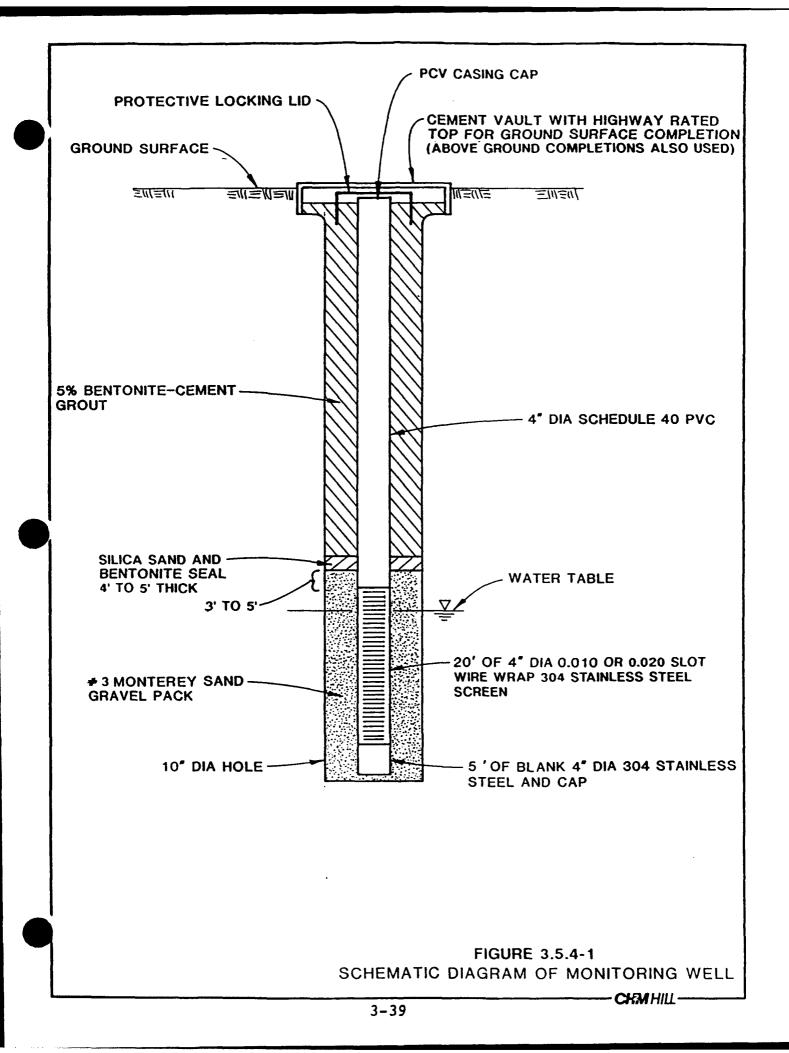
3.5.5 FIELD MEASUREMENTS AND DATA ACQUISITION

Field measurements were obtained based on media considerations as well as appropriateness to specific field work being conducted. All field activities were first noted in the sampler's assigned bound and numbered field notebook. Specific data and descriptions were then recorded on appropriate preprinted bound forms particular to activity and media.

3.5.5.1 Field Measurements and Data Acquisition During Well Construction and Testing

During all well drilling, soil data were entered on soil boring logs using the Unified Soil Classification System (USCS) (ASTM D2487-84 and 85) in accordance with Section 2 and Appendix D of the QAPP (CH2M HILL, 1988b). Water levels were measured with a water level sounder and recorded in the field notebooks.

Three safety devices were used during drilling: an HNU PI 101 Organic Vapor Meter (OVM), an S.E. Radiation Alert Monitor 4, and an MX 241 Explosimeter. Readings from this equipment were entered in bound field notebooks. HNU readings were also included on the boring logs. The radiation monitor was checked at least once per drilling, and the explosimeter and HNU were checked approximately



every 30 minutes (depending on the site) at the open end of the dual tube drill pipe, the drill cuttings, and the breathing zone.

Aquifer pump tests were performed at all new monitoring wells using nearby monitoring wells as observation wells when possible. Pump test analysis is discussed in detail in Appendix E which includes data plots for all tests. A pump test generally consisted of 4 hours of pumping and 4 hours of recovery time. In order to induce adequate water level drawdown in the pumping and observation wells, pumping rates were monitoring well specific. Pump rates ranged from 1 to 50 gallons per minute (gpm) using Grundfos 1/3- to 3-horsepower stainless steel submersible pumps. Groundwater level drawdowns and recoveries were measured with an In-Situ Hermit Environmental Data Logger (Model SE 1000B), which automatically collected the drawdown recovery data. Data were then transferred to a portable computer in the field office to facilitate plotting and calculations.

At Site 19, a 72-hour pump test was performed on the dedicated pumping well (6-inch-diameter casing and screen). One Hermit data logger was used on the pump well, and the other logger was used on two nearby wells. A water level sounder was used manually at the third observation well, and its data were recorded in the field notebooks. To account for changes in the aquifer level due to changing air pressure, barometric pressure was obtained from the Beale AFB weather station and recorded in the field notebooks. Water levels were also related to barometric pressure readings in the pump test wells for a period of 72 hours prior to the test, and during the test in nearby well 6-C-1. An HNU PI 101 OVA was used to monitor organic vapor concentrations at the top of the wells; data were recorded in the field notebooks.

To calculate groundwater level contours, water levels in all monitoring wells at Beale AFB were measured relative to the surveyed measuring points with a calibrated Solonist electric sounder. The same operator and the same instrument conducted all measurements in each round to maintain consistency.

3.5.5.2 Field Measurements and Data Acquisition during Soil Sampling

During all soil sampling, soil data were entered on soil boring logs using the Unified Soil Classification System (ASTM D2487-84 and 85). Three safety devices were used during drilling: an HNU PI 101 Organic Vapor Meter, and S.E.

Radiation Alert Monitor 4, and an MX 241 Explosimeter. Readings from this equipment were entered in bound field notebooks. HNU readings were also included in the boring logs (Appendix D). The radiation monitor was checked at least once per drilling, and the explosimeter and HNU were checked approximately every 30 minutes (depending on the site) at the auger hollow stem, the drill cuttings, and the breathing zone.

3.5.5.3 Field Measurements and Data Acquisition During Water Sampling

For all water samples, the following parameters were measured during sampling and well purging: pH was measured by either an Orion 230 or Orion 250 pH meter; temperature was measured by a Fisher mercury thermometer; electrical conductivity was measured by a YSI 33 SCT meter; and photoion potential of the vapors coming off of the purged water was measured by an HNU PI 101. Samples to be analyzed for total dissolved metals were filtered through a 0.45 micron filter with a Geofilter peristaltic pump before being preserved with nitric acid. A portion of the unpreserved sample was titrated using a field Hach titration kit to determine the alkalinity of the water sample prior to shipment to the laboratory.

In addition, weather conditions (i.e., cloud cover, precipitation, air temperature, and wind speed and direction), water clarity, and pump discharge rate (for groundwater) were noted in the bound well diaries.

3.6 SAMPLING PROGRAM FOR AIR, WATER, SOIL, SEDIMENT, AND BIOLOGICAL DATA

3.6.1 TYPES AND NUMBERS OF SAMPLES TAKEN

The number of analyses conducted, by site, is given in Table 3.6.1-1 (soil) and Table 3.6.1-2 (water). A summary of the total number of environmental samples and field QC samples collected per sampling round is given in Table 3.6.1-3.

3.6.2 SAMPLING METHODOLOGY AND PROTOCOLS

Sampling was conducted in accordance with the QAPP (CH2M HILL, 1988b) and the USAFOEHL Technical Services Division Handbook (USAF, 1988).

Table 3.6.1-1
SUMMARY OF SOIL, SEDIMENT, AND AIR SAMPLE ANALYSES BY SITE FOR STAGE 2-1 REMEDIAL INVESTIGATION

PARAMETER	ANALYTICAL METHOD	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 9	Site 11	Site 13
Oil & Grease		6 1 6 6 7 7	· · · ·	• • • • • •	: : : :		• • • • • •		•	•
Petroleum Hydrocarbons (Gasoline/Diesel)	CALIF	%	53	58	'n	59	27	5	9	53
ICP Screen (23 metals, exclude Boron and Silics)	SW3050/SW6010	%	53	28	m		27	'n	•	- 58
Mercury	SW7471		53	58			27	ĸ		54
Organochlorine Pesticides and PCBs	SW3550/SW8080							S		
Chlorinated Phenoxy Acid Herbicides	SW8150							'n		
Volatile Organic Compounds	SW8240	54	53	58			27	ĸ	•	28
Semivolatile Organic Compounds	SW3550/SW8270	5%	53	28			27		9	59
Soil Moisture Content	ASTM D2216	54	53	28	'n	53	27	'n	•	53
Soil p#	SN9045				'n					
Polychlorinated Dibenzo-pdioxins (PCDDs) and polychlorinated Dibenzofurans (PCDFs)	SW8280		-							
Explosives	USATHAMA Method 48									
Ignitability	SW1010			28						
Cyanide, Total	su9010		53							
Air Samples Analyses	Calif ADDL002									

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Table 3.6.1-1 (Continued)

PARAMETER	ANALYTICAL METHOD	Site 15	Site 16	Site 18	Site 19	Site 20	Site 21	Site 23
Oil & Grease	1/06/ns	6 9 9 1 1 1 5 6 6	; ; ; ; ; ; ; ; ;	* * * * * * * * * * * * * * * * * * *		60		•
Petroleum Hydrocarbons (Gasoline/Diesel)	CALIF	&	m	5 7	21		v	50
<pre>1CP Screen (23 metals, exclude Boron and Silica)</pre>	SW3050/SW6010	&	м	57	21	€0		2
Mercury	1.177NS	59	M		21	€0		
Organochlorine Pesticides and PCBs	S43550/S48080							
Chlorinated Phenoxy Acid Herbicides	SW8150							
Volatile Organic Compounds	SW8240	53	m	57	21	€0		20
Semivolatile Organic Compounds	SW3550/SW8270	&	m		2	60		
Soil Moisture Content	ASTH D2216	&	m	45	21	€0	\$	20
Soil pH	SW9045							
Polychlorinated Dibenzo-pdioxins (PCDDs) and polychlorinated Dibenzofurans (PCDFs)	SW8280				-			
Explosives	USATHAMA Method 48		м					
Ignitability	SW1010					60		
Cyanide, Total	SW9010							
Air Samples Analyses	Calif ADDL002	2	0 1 4 1 1 1 1 1 0 0	1 1 1 1 1 1 1				;
		,						

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Table 3.6.1-2
SLMMARY OF GROUNDWATER AND SURFACE WATER (GW/SW) ANALYSES BY SITE
FOR STAGE 2-1 REMEDIAL INVESTIGATION

Alkatinity-Carbonate, Bicarbonate & Hydroxide (Field Test) Specific Conductance E120.1 24 (Field Test) DH (Field Test) Total Dissolved Solids E160.1 24, Temperature (Field Test) E170.1 24, Fluoride, Sulfate) Eucommon Anions (Chloride, E325.3 24, Fluoride, Sulfate)	24/20 24/0 24/20 24/0 24/20 24/0 24/20 24/0 24/20 24/0 24/20 24/0	12/0 12/0 12/0	2/0	7/7	12/4	2/0	7/U£
E120.1 E150.1 E160.1 E170.1		12/0					r }
E150.1 E160.1 E170.1 E325.3		12/0	2/0	7/7	12/4	2/0	30/4
E160.1 E170.1 E325.3 E340.2			2/0	7/7	12/4	5/0	30/4
E170.1 E325.3 E340.2		12/0	2/0	7/7	12/4	2/0	30/4
E325.3 F340.2		12/0	2/0	7/7	12/4	2/0	30/4
E375.2		12/0 12/0 12/0	2/0 2/0 2/0	7 7 7 7 7 7	12/4 12/4 12/4	2/0 2/0 2/0	30/4 30/4 30/4
Nitrogen, Nitrate-Nitrite E353.2 24,	24/20 24/0	12/0	2/0	7/7	12/4	2/0	30/4
Petroleum Hydrocarbons CALIF 24, (Gasoline/Diesel)	54/20	12/0	2/0	7/7	12/4	2/0	30/4
ICP Screen (23 metals, su3005/SW6010 24, exclude Boron and Silica)	54/20 54/0	12/0	2/0	7/7	12/4	2/0	30/4
Arsenic SW7060 24,	24/20 24/0	12/0			12/4		30/4
Lead SW3005/SW7421 24/	54/20 54/0	12/0	2/0		12/4	2/0	30/4
Mercury SW7470	54/0	12/0			12/4		30/4

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Table 3.6.1-2 (Continued)

PARAMETER	ANALYTICAL METHOD	Site 1 GW/SW	Site 2 GW/SW	Site 3 GW/SW	Site 4 GW/SW	Site 5 GW/SW	Site 6 GW/SW	Site 11 GW/SW	Site 13 GW/SW
Selenium	07.LMS	• • • • • • •	54/0	18/0		e 1 4 5 6 5 9 1 4 6	12/4		30/4
Purgeable Malocarbons	SW5030/SW8010	28a/20	18/0	18/0		7/7	12/4	2/0	35a/4
Purgeable Aromatics	SW5030/SW8020	24/20	18/0	18/0			12/4	2/0	30/4
Semivolatile Organic Compounds	SW3510/SW8270	24/20	18/0	18/0			11/3	2/0	59/4
Chemical Oxygen Demand (COD)	A508A						12/4		30/4
TNT, RDX, Picric Acid	USGS01								
1 0			18/0						
GW = GROUNDWATER SW = SURFACE WATER a: includes off-base well samples	s for third and fourth sampling rounds.	urth samplin	ng rounds.						

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Table 3.6.1-2 (Continued)

	ANALYTICAL METHOD	Site 15 GW/SW	Site 16 GW/SW	Site 18 GW/SW	Site 19 GW/SW	Site 21 GW/SW	Site 23 GW/SW	GROUND GU/SW
Alkalinity-Carbonate, Bicarbonate & Hydroxide (Field Test)	A403	16/0	0/7	0/7	15/4	2/0	2/0	0/2
Specific Conductance (Field Test)	£120.1	16/0	0/7	0/7	15/4	2/0	2/0	0/2
pH (Field Test)	E150.1	16/0	0/7	0/7	15/4	2/0	2/0	0/2
Total Dissolved Solids	E160.1	16/0	0/7	0/7	15/4	5/0	2/0	0/2
Temperature (Field Test)	£170.1	16/0	0/7	0/7	15/4	5/0	2/0	0/2
Common Anions (Chloride, Fluoride, Sulfate)	E325.3 E340.2 E375.2	16/0 16/0 16/0	0/4	0/5 0/7	15/4 15/4 15/4	2/0 2/0 2/0	2/0 2/0 2/0	0/2 0/2 0/2
Nitrogen, Mitrate-Witrite	E353.2	16/0	0/7	0/7	15/4	2/0	5/0	0/2
Petroleum Hydrocarbons (Gasoline/Diesel)	CALIF	16/0	0/4	0/7	15/4	2/0	2/0	0/2
ICP Screen (23 metals, exclude Boron and Silica)	SW3005/SW6010	16/0	0/7	0/7	15/4	2/0	2/0	0/2
Arsenic	090ZNS	16/0	0/7		15/4			0/2
Lead	SW3005/SW7421	16/0	0/7	0/7	15/4		2/0	0/2
fercury	0174NS	16/0	0/4		15/4			0/2

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Table 3.6.1-2 (Continued)

PARAMETER	ANALYTICAL METHOD	Site 15 GW/SW		Site 18 GW/SW	Site 19 GW/SW	Site 21 GW/SW	Site 23 GW/SW	Back- Ground GW/SW
Selenium	SW7740	16/0	0/7		15/4			0/2
Purgeable Halocarbons	SW5030/SW8010	16/0	0/7	0/7	15/4	2/0		0/2
Purgeable Aromatics	SW5030/SW8020	16/0	0/7	0/7	15/4		2/0	1/0
Semivolatile Organic Compounds	su3510/su8270	16/0	0/7		15/4			0/2
Chemical Oxygen Demand (COD)	A508A	16/0			15/4			0/2
TNT, RDX, Picric Acid	USGS01		0/7					

GW = GROUNDWATER SW = SURFACE WATER

Table 3.6.1-3 SUMMARY OF SAMPLE TYPES AND MEDIA

		Grou	ndwat	er			Surf	ace W	ater		Sofl	Surfac	a	
Sample Type	lst	2nd	3rd	4th	1st 2nd 3rd 4th Total	lst	2nd	3rd	4th	2nd 3rd 4th Total	Boring	So11	Boring Soil Sediment Air	Air
Environmental	97	31	51	34	34 167	10	∞	10	∞	36	268	09	39	- 2
Replicate	2	S	4	4	18	က	2	0		•	25	9	ო	
Equipment Blank	Ŋ	က	4	4	16	3	2	0	-	9				
Ambient Condition Blank	ۍ	က	ς.	4	17	ო	8	0	~	9				
Travel Blank	ო	S	ς.	က	16	7	0	-	-	7	18	S	က	

Notes: Includes all off-base groundwater samples.

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3.6.2.1 Groundwater Sampling

After development, the groundwater wells were allowed to stabilize for a minimum of 3 days before sampling. When possible, wells judged to potentially yield samples containing low levels of contamination were sampled prior to those judged to have higher levels. Weather conditions were recorded at the time of sampling (e.g., wind direction and speed, ambient temperature, precipitation).

Prior to purging each well, the initial water level was measured with a Solonist electric sounder to the nearest 0.01 foot with respect to the established survey point on top of the well casing. Based on the static water level, the volume of water in the well casing and gravel pack was calculated.

Each well was then purged a minimum of three effective well volumes (volume of water in the well casing plus volume of water in the sand pack) and until the pH, temperature, and electrical conductivity of the discharge water stabilized in repeated measurements during purging within +0.1 pH units, ± 0.5 degrees C, and ± 10 umhos conductivity. Once stabilized, the well was sampled. However, if stabilization was not reached within 30 minutes and after ten well volumes were removed, the well was sampled at that time. Wells were purged either by bailing, with a stainless steel decontaminated bailer, or if more cost-effective, by pumping using a stainless steel submersible pump decontaminated before and after use. Some of the monitoring wells had low yields and thus were pumped dry three times in order to take a representative formation water sample. Well discharge was also measured intermittently during purging using a stopwatch and calibrated 5-gallon container.

Well development, aquifer testing, and groundwater sampling purge water was placed in portable tanks which were taken to the sewage treatment plant and discharged in accordance with instructions from the California Department of Health Services and Regional Water Quality Control Board. If a monitoring well had no detected contamination based on previous results, water was discharged to the ground.

Samples were collected in the appropriate laboratorysupplied containers. Samples were collected with a decontaminated Teflon hand bailer with a dedicated line used for only one well. Sample bottles were prepared by adding required sample preservatives at the field office prior to daily sampling activities. Two-person sampling teams were used (one sampler, one recordkeeper).

Relevant information was recorded in the field notebook and on the sample collection log. Immediately following sample collection, field water quality parameters (temperature, pH, electrical conductivity, and visual clarity) were analyzed again and recorded.

Sample bottles were kept out of the sun to keep them cool prior to sampling. The filled sample bottles were immediately placed in an iced cooler.

When sampling for VOCs, each 40-ml vial was filled until the sample formed an inverted meniscus that eliminated air bubbles and allowed no head space. After filling, each vial was turned upside-down and tapped to check for air bubbles. If there were any bubbles, a new vial was filled and checked. This procedure was repeated until an acceptable sample was obtained.

3.6.2.2 Surface Water Sampling

Surface water samples were collected in midflow of moving water or in the middle of a pool of standing water. The sample container was inverted before being submerged. To collect the sample, the mouth of the container was positioned facing upstream at a 45-degree angle above horizontal, from ½ inch to 2 inches below the surface of the water. When the depth of the water being sampled prevented submersion of the sampling container, smaller sample collection containers were used to obtain the sample. These were immediately transferred to the appropriate container.

Sampling personnel stood downstream with respect to the sampling container at all times. Multiple samples at a given site were obtained with downstream samples taken first and subsequent samples collected progressively upstream.

Samples to be preserved were collected in new collection containers, then immediately transferred to the appropriate container containing preservative.

Sample collection data were recorded in the samplers' bound field notebooks and in the bound water sample collection logs. The electrical conductivity, pH, temperature, and visual clarity of the surface water samples were determined immediately after sampling. Samples were sealed, labeled, and immediately placed in a cooler at approximately 4°C.

3.6.2.3 Soil and Sediment Sampling

Subsurface soil sampling was done using ASTM Method D-1586 with a modified California split-spoon drive sampler with three 6-inch-long brass liners.

Prior to each sampling, the modified California drive sampler was decontaminated. As each sample was recovered, the exposed ends of each sleeve were examined and logged. The sample ends were then wrapped with a Teflon sheet, capped with plastic caps, and sealed with electrical tape. The sample container was marked with the sample number, location, date, and time, as described in the QAPP (CH2M HILL, 1988b). The outsides of the sample containers were wiped with deionized water, and the sample was placed in clean plastic bags. Samples were immediately placed in coolers at approximately 4°C. All samples were logged on chain-of-custody sampling forms, a sampling log, and recorded in a field notebook maintained by the on site supervisor.

Surface soil samples were collected after establishing the surface sampling points by measurements from known locations. The surface vegetation, if present, was removed. The soil was sampled with a stainless-steel trowel or hand auger. An established volume of soil was collected. Any obviously discolored areas observed near the sampling location were sampled. Once the jars were filled, the sampling equipment was decontaminated. All surface samples were marked with the sample number, date, time, and other appropriate information, and immediately stored in coolers at approximately 4°C. All sampling information was recorded in sample log books, chain-of-custody forms, and the field notebook maintained by the onsite supervisor.

During all soil sampling activities, an HNU PI 101 OVM was used to measure headspace concentrations of organic vapors from soil samples and to measure work place concentrations. Work place concentrations were monitored approximately every 30 minutes during drilling/sampling activities. Monitoring was conducted especially during activities with highest potential for vapor emissions. Monitoring was accomplished by holding the analyzer inlet probe at breathing level (4 to 5 feet above ground), in the vicinity of the highest emission source (usually near the well or borehole opening), and monitoring concentration of organic vapors for a minimum period of 10 seconds. Results were compared to background concentrations measured upwind from the work area. The HNU was calibrated at the beginning of each day using ultra-pure

air, and low- and high-level scandards. The analyzer(s) was also checked for performance at the end of each working day and any significant drift in the precision or accuracy of the instrument was recorded.

3.6.2.4 Biological Sampling

No biological sampling was conducted as part of Stage 2-1 activities. Biological sampling will be conducted, if necessary, in future IRP stages.

3.6.2.5 Air

The air sampling at Site 15 (Landfill No. 3) was conducted according to the Calderon testing protocol for Category 2 landfills. The four tests described in Section 3.4 were each conducted once.

3.6.2.1 Emissions Screening

The area selected for emissions screening was approximately 100 feet wide by 500 feet long, and extended over a backfilled landfill trench. The trench had been capped for approximately 1½ years. A Foxboro Century Organic Vapor Analyzer (OVA) was carried over a 25-foot grid in this area.

The weather at the time of emissions screening was mostly sunny with high clouds. The wind was 3 to 5 knots (4 to 6 mph) out of the northwest. The temperature was approximately 90 degrees F.

3.6.2.2 Downwind Ambient Air Testing

The ambient air testing was performed on the downwind side of Site 15 (Landfill No. 3). Before sampling began, the Beale AFB weather station was contacted to ascertain the wind velocity. During sample collection, the weather station was contacted periodically for updates on current wind speed and direction. When the wind direction changed, the sampling was halted briefly while the sampling train location was moved to the new downwind location. At the conclusion of the 24-hour period, the three 10-liter Tedlar bags were shipped in light-proof boxes to a laboratory for analysis.

3.6.2.3 Landfill Gas Testing

A soil vapor well was constructed above a backfilled land-fill trench at Site 15 (Landfill No. 3). The landfill

operator was consulted for locations of backfilled landfill trenches. A trench was selected that extended east-west across the length of the landfill. During operation this trench had accepted domestic refuse. The trench has been capped for approximately 1½ years, and has additional capped trenches located to the north and south. A hole was drilled through the clay cap to a total depth of 9 feet. The boring extended approximately 6 feet into the refuse. Sampling was done at least 24 hours after construction of the well. A 10-minute, 10-liter sample was taken and shipped in a light-proof box to the laboratory for analysis.

3.6.2.4 Gas Migration Testing

Soil vapor wells were constructed on the north, east, south, and west sides of Site 15. Each well was positioned outside the landfill boundary. The four vapor wells were similar to the vapor well used for landfill gas testing. At least 24 hours after well construction, the soil vapor wells were purged and the pump effluent monitored with an OVA. Purging continued until a stable OVA reading was reached.

All Tedlar bag samples were shipped immediately after sample collection to the laboratory for analysis. The Tedlar bags were shipped in light-proof containers with custody seals. All samples were analyzed before the 72-hour holding time expired. No field blanks or duplicates were taken.

3.6.3 SAMPLE PRESERVATION METHODS, REQUIRED CONTAINERS, AND HOLDING TIMES

Table 3.6.3-1 presents the methods of sample preservation for analyses employed in Stage 2-1. The table also shows the methods of sample packaging and shipping criteria.

Table 3.6.3-2 gives the allowable holding times for samples collected during Stage 2-1.

Samples obtained during the field investigations were packed for shipment in the following manner:

- Each container was packaged and sealed in a separate sealable plastic bag. Figure 3.6.3-1 shows the process for packaging soil and sediment samples and Figure 3.6.3-2 illustrates packaging for groundwater and surface-water samples.
- o Both the inside and outside of cooler drains were taped.

Table 3.6.3-1
SAMPLE QUANTITIES, BOTTLES, PRESERVATIVES, AND PACKING FOR
SAMPLES PROM BEALE AFB, CALIFORNIA

ulveis Analysis Containers Sample Volume Preservation Shipping Packaging	3 VOA viale 3 x 40 ml, no 2 drops 1:1 HCL, Priority 1 No. 1 foam liner from sunlight	3 - 2½-liter amber Fill bottle to bottles with Teflon- neck lined cap	**Resolved 1-liter high-density Pill bottle to Filter through Priority 1 No. 1 foam liner O.45 mm filter octable wrap (groundwater only) nitric acid to PH 52, iced to 4°C	tal 1-liter high-denaity Fill bottle to Nitric acid to Priority I No. I foam liner polyethylene bottle neck pH <2, iced to 4.C or bubble wrap	1-litter high-density Fill bottle to NaOH to pH >12 Priority 1 No. 1 foam liner polyethylene bottle neck acid, cool to 4.0	itrite i 125-ml high-density Fill bottle to H ₂ SO ₄ to pH <2 Priority l No. 1 foum liner polyethylene bottle neck liced to 4°C or hubble stan	2 VOA viala 3 - 1 liter amber no headapace glaus bottles Fill to bottleneck	<pre>1-liter high-denaity polyethylene bottle</pre>	Soll Modified California 3 wheeves Iced to 4°C Priority 1 (if in cans packed split-spoon with 2-inch diameter medium or high in bubble wrap brass sleeve capped 6 inches long hazard, include
Analysis	Volatiles	Semivolatiles and Pesticides	Metals - Dissolved	Metals - Total	Cyanide	Nitrate + Nitrite	Total Fuel Hydrocarbons	Carbonate, Bicarbonate, Chloride, Sulfate, Total Dissolved Solids	Subsurface Soil Pollutant Analysis (all analytes)

Table 3.6.3-1 (Continued)

Packaging	Foam Liner No. 3	Foam Liner No. 3			Protective Container	Protective container
Shipping	Priority 1 (1f medium or high hazard, include certificate for restricted ar-	Priority i (if medium or high hazard, include certificate for restricted articles)	Priority 1 (if medium or high hazard, include certificate for restricted ar-		Priority i	Priority i
Preservation	iced to 4°C, away from eunlight	iced to 4°C, away from aunlight	lced to 4°C, away from sunlight		Keep away from sunlight	Keep away from sunlight
Sample Volume	. F111 full	Fill full	Fill full (no headepace)		10 lirer	30 liter
Containere	1 - 125-ml, 4 - 500-ml wide-mouth glass jars	1 - 500-ml wide-mouth glass jar	<pre>1 - 500-ml wide- mouth glass jar</pre>		10-liter Tedlar bag	30-liter Tedlar bag
Analysis	Surface Soil and Wastes Pollutant Analysis Hazard Classification (all analytes)	Dioxin, Purans	Total Fuel Hydrocarbons	Air Contaminante	Lundfill Gas	Amblent Air

*Priority i = Next day delivery

Table 3.6.3-2 HOLDING TIMES FOR SAMPLES, BY ANALYSIS

Analysis		ing Time (I	
Analysis	Air	Water	Soil
8010, 8020, 8240		14	14
8270 Extraction Analysis after extraction		7 40	14 40
8280 Extraction Analysis after extraction		7 40	14 40
8080 Extraction Analysis after extraction	 	, 7 40	14 40
8150 Extraction Analysis after extraction		7 40	14 40
Total Fuel Hydrocarbons Extraction Analysis after extraction		14 40	14 40
Metals		6 mo.	6 mo.
Mercury		28	28
Cyanide	·	14	14
Ammonia		28	7
TKN		28	7
Nitrate + Nitrite Extraction Analysis after extraction		28	7 28ª
Carbonate, Bicarbonate		14	N/A
Chloride		28	N/A
Sulfate		28	N/A
Total Dissolved Solids		7	N/A
Ambient Air	3		~~
Fixed Gas	3	~-	

 $^{^{\}rm a}{\rm Extract}$ preserved with ${\rm H_2SO_4}$

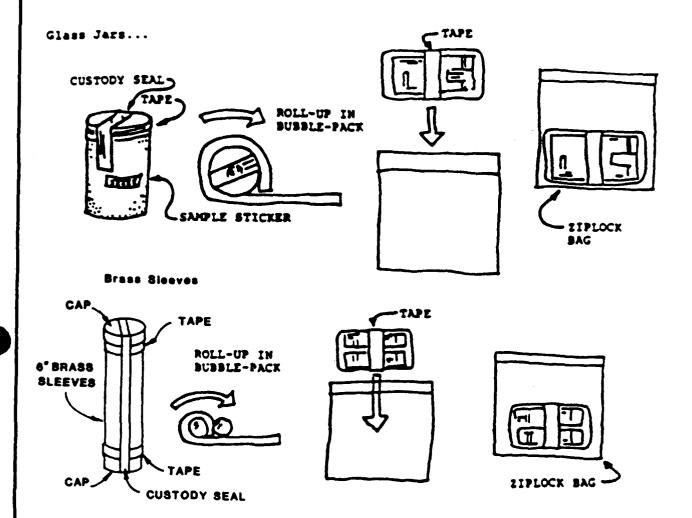
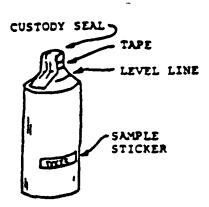
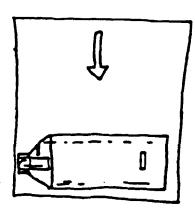


FIGURE 3.6.3-1
SOIL AND SEDIMENT SAMPLE PACKAGING

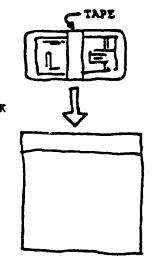


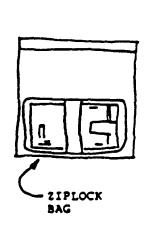




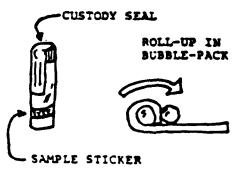












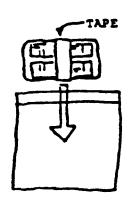
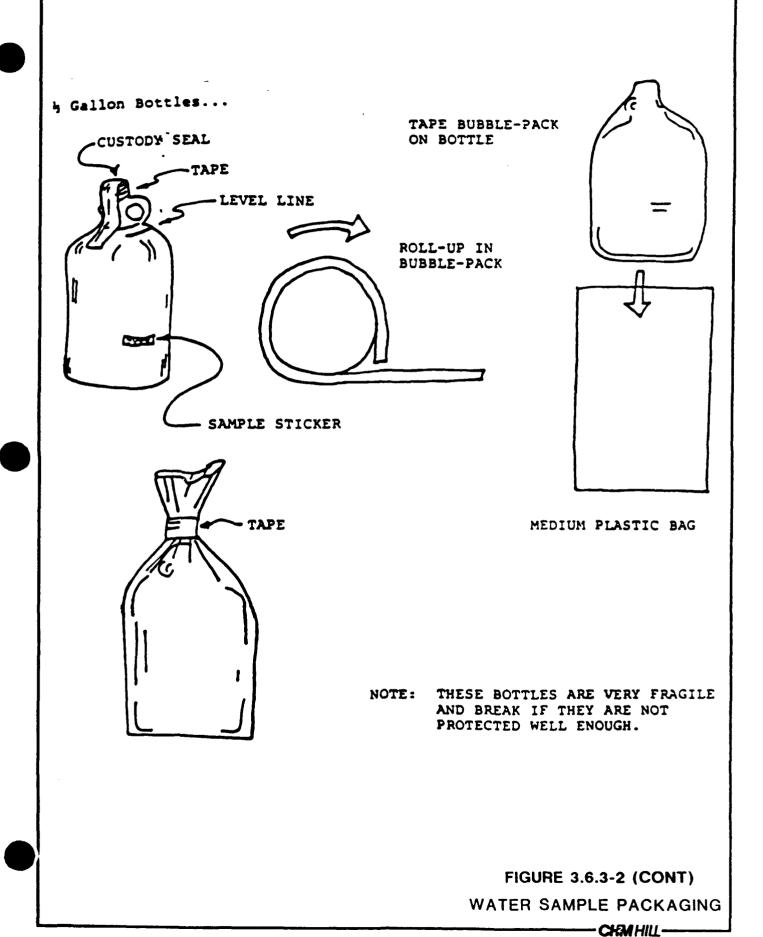




FIGURE 3.6.3-2
WATER SAMPLE PACKAGING



- o Coolers were lined with large plastic bags, and approximately 3 inches of vermiculite was placed in the bottom of the bags.
- o The sample containers and ice packages in sealable plastic bags were placed on end in the cooler and arranged so they did not touch, and the voids were filled with vermiculite.
- o The large plastic bags were taped closed and custody sealed.
- o A custody seal was placed on each sample container.
- o A mailing label with the laboratory address was placed on top of each cooler.
- o "THIS SIDE UP" labels were attached on all four sides of each cooler. "FRAGILE" labels were attached on at least two sides of each cooler.
- o Shipper's address was written on outside of cooler.
- o Each cooler weighed less than 70 pounds.

Shipping containers were plastic or metal-clad ice chests, in good condition, capable of retaining fluids should a sample loss occur.

3.6.4 FIELD QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM

A variety of QC procedures have been implemented in the Stage 2-1 field sampling activities at Beale AFB in accordance with the USAF Statement of Work and the USAF Technical Services Division Handbook (USAF, 1988). A summary of field and laboratory quality control procedures is given in Table 3.6.4-1. Descriptions of these procedures are listed below and are given in the QAPP (CH2M HILL, 1988b).

3.6.4.1 Background Samples

In addition to background soils and groundwater samples collected at selected individual sites, background groundwater samples were collected from two wells installed on the base upgradient of all sites. Quarterly sampling was conducted for I year at these wells.

Table 3.6.4-1 SUMMARY OF QUALITY CONTROL PROCEDURES STAGE 2-1

FIELD QC

Sample Type	Target Frequency	Daily <u>Minimum^a</u>	Comment
Replicate (water)	10%	None	
Replicate (soil)	10%	None	If sufficient volume
Equipment (Field) Blank (water)	10%	None	Water only
Ambient Condition Blank (water)	10%	None	Water only - 8010/8020 only
Trip blank (water and soil)	10%	None	Water - 8010/8020 only Soil - 8240 only

LABORATORY QC

Sample Type	Target Frequency	Daily Minimumb
Duplicate	5%	1/analysis method
Blank	5%	l/analysis method
Matrix spike	5%	l/analysis method
Surrogate spike	(method specific)	(method specific)
Control	5%	1/analysis method

 $^{^{\}mathrm{a}}\mathrm{During}$ sampling activities for specific media

 $^{^{\}mathrm{b}}\mathrm{During}$ analysis activities for specific methods

3.6.4.2 Field Replicate Samples

Field replicate samples were collected at a rate of approximately 10 percent per media sampled. For surface soils or waste samples (solids), replicate samples were collected by splitting samples, provided that sufficient sample volume could be collected. If sufficient sample volume could not be obtained in a single split-spoon sample, the sampler was driven in a second time to obtain the replicate sample.

Field replicate samples collected from soil borings consisted of sequential modified California Split Spoon intervals.

For all water samples, replicate samples were collected by retaining consecutive samples from the sampling device (bailer, pump discharge, or grab container).

3.6.4.3 Field Blanks

Field blank samples, also called equipment blanks, were collected at the rate of approximately 10 percent of project samples (no daily requirement) for water samples only. Field blanks for water samples were collected utilizing field sampling techniques, but substituting deionized (DI) water instead of actual samples. For well samples collected with bailers, deionized water (Type II, Reagent Grade) was placed in the sampling bailer, after decontamination, then placed in sample containers. Grab water sample field blanks were collected in a similar fashion, by adding DI water to the sample collection container, after decontamination, then retained in sampling containers. For all water samples, field blank collection followed actual sampling methods as closely as possible.

No field blank samples were collected for solid (soil and waste) media.

3.6.4.4 Ambient Condition Blanks

Ambient condition blanks were collected at a rate of approximately 10 percent of water samples collected for purgeable organic analyses (8010/8020). Ambient condition blanks were collected by placing deionized water (Type II, Reagent Grade) in sampling bottles, at the sampling site. These differ from field blanks in that the water is not passed through the sampling equipment.

3.6.4.5 Trip Blanks

Trip blank samples were collected at a rate of approximately 10 percent of liquid samples for purgeable organic analyses (8010/8020). Trip blanks are similar to other blanks in that they are prepared with Type II Reagent Grade water. They differ from other blanks in that the water is not exposed to field conditions. Trip blanks were prepared at the laboratory, shipped to the field office, and shipped with field samples back to the laboratory.

3.6.4.6 Sample Labels

All samples were labeled with information identifying the sample location, date and time of sample collection, sampler, and other relevant data, as appropriate. All samples were assigned a unique identifying number which was written on the sample label, and affixed as a separate printed label.

All labels were filled out using indelible ink and affixed to the sample containers via the adhesive backing. An example of the sample label to be used is given in Figure 3.6.4-1.

3.6.4.7 Chain-of-Custody Record

A Chain-of-Custody Record was filled out for each sample shipment container. All samples within a container had to be accounted for on the Chain-of-Custody Record. An example of the Chain-of-Custody Record is given in Figure 3.6.4-2.

3.6.4.8 Transfer of Custody and Shipment

Samples were accompanied at all times by a Chain-of-Custody Record. When transferring samples, the individuals relinquishing and receiving the samples signed, dated, and noted the time on the record. This record was used to fully document sample custody transfer from the sampler, often through another person, to the analyst at the laboratory.

Samples were packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipping container. Shipping containers were sealed with custody seals for shipment to the laboratory. The method of shipment, courier name(s), and other pertinent information were

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EXAMPLE LABEL & CUSTODY SEAL

FIGURE 3.6.4-1

Signature	**************************************	Dulles . A.k.	CUSTODY SEAL
Date	Munnow.	January 10ero	Date
CUSTODY SEAL	SALVE OSTING	REPART PROTECTION	Signature

Снуни	Environmental Lab 2218 Railroad Avenue Redding, CA 96001
Client	
Sample Description	
Location	
Analysis	
Preservative	
Oate	. By

FIGURE 3.6.4-2

PROJECT NUMBER	PROJECT NAME	CHAIN OF CUSIODY RECORD		100	Constitution of the consti		VINO 381 84 1 GOS) >
				ASSETS	S KEGUESIEU		D 360 801	
CLIENT NAME							Use *	
REPORT 10		COPY TO	NINERS				ACK	Q
REQUESTED COMPLETION DATE		LABORATORY	Ot CONI				DATE INVOICED	7
SIA NO DAIE IIME	ев ув сомь	SAMPLE DESCRIPTION	NUMBER (DISPOSITION: D. R. REMARKS	
:		f					1	:
				-				
				-				
				-				
		The state of the s						: :
:	1							
i								
SAMPLED BY AND ITLE (SIGNATURE)	LATURE)	DATE/TIME RELINQUISH	RELINQUISHED BY (SIGNATURE)		DATE/TIME	RECEIVED BY: (SIGNATURE)	(SIGNATURE)	DATE/TIME
-		2				3		
RELINQUISHED BY (SIGNATURE)	RE) DATE/TIME	RECEINED BY (SIGNATURE)	DATE/TIME RE	RELINQUISHED BY: (SIGNATURE)	: (SIGNATURE)	DATE/TIME	RECEIVED BY LAB: (SIGNATURE)	DATE/TIME
4		5					7	
REMARKS		AWGS	APUN.	S PROGRAM PCPA	AM	SAMPLE SHIPPED VIA	VIA AIR BUS BILL NUMBER	BER
						4	_	

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entered in the Remarks section of the Chain-of-Custody Record. An example of the custody seal is also given in Figure 3.6.4-1.

If sent by mail, the package was registered with return receipt requested. If sent by common carrier, a bill or lading was used. Air freight shipments were sent collect. Freight bills, postal service receipts, and bills of lading were retained as part of the permanent documentation.

Documents were distributed as follows:

- o Shipped with samples:
 - Chain-of-Custody Record (original)
- o Returned to CH2M HILL files:
 - Chain-of-Custody Record (pink copy)
 - Shipping records

3.6.4.9 Sample Identification

Samples were assigned alpha-numeric numbers unique to each sample. The sample numbers began with BAFB-0001 and progressed sequentially (BAFB-0002, BAFB-0003, etc.). This simplified numbering system was easy to use and resulted in few errors.

A Master Field Logbook was used to describe each sample collected in terms of appropriate identifying information.

3.6.4.10 Field Record Keeping

In addition to completion of the Chain-of-Custody Record, soil boring logs, well completion logs, and other preprinted data forms, all team members were assigned bound field notebooks, in which significant events, observations, and measurements were recorded. These notebooks were kept as permanent records. During field work, notebook pages were copied weekly to serve as a backup in case the original notebook was lost or destroyed. Notebook copies were maintained in CH2M HILL Sacramento office files.

In addition to the field notebooks, a field Master Sample Log was maintained in a bound notebook kept at the field headquarters. All samples collected at the base were logged in the Master Sample Log on a daily basis. The Master Sample Log utilized sample numbers printed on adhesive labels.

Each number was printed on three labels. At the beginning of each sampling episode, field team members took an appropriate number of labels to the sampling locations. This prevented duplication of numbers if multiple sampling was in progress. After each sample was collected, the sampler placed one of the three labels on the sample, and placed a second label in his/her field notebook, along with a sample description. At the end of a sampling episode, the third label was placed in the Master Sample Log, with appropriate data. This three-sticker system prevented number transposition and disagreements between field logs, Master Sample Log, and samples.

If for any reason a sample number was not used (accidentally skipped), all three labels were placed in the Master Sample Log to indicate that number was not used.

The Master Sample Log was copied regularly. An updated copy is kept on file in the CH2M HILL office in Sacramento.

3.6.4.11 Corrections to Documentation

Unless prohibited by weather conditions, all original data recorded in field notebooks, the Master Sample Log, sample identification tags, and Chain-of-Custody Records were written in waterproof ink.

If an error was made on an accountable document assigned to one individual, that individual made corrections by crossing a line through the error and entering the correct information. The erroneous information was not obliterated. Any subsequent error discovered on an accountable document was corrected by the person who made the entry. All subsequent corrections were initialed and dated.

3.6.4.12 Field Calibration Procedures

Field equipment requiring calibration includes the electrical conductivity and pH meters and water-level measurement meters. The conductivity and pH meters were calibrated prior to and at the completion of each day's use to standards in accordance with procedures and schedules outlined in the particular model's handbook. The calibration standards for these instruments and the suppliers from which standards are obtained are:

EC 223, 1,000 umhos/cm Fisher Scientific, Tustin, California

pH 4, 6.8, 10 buffers Fisher Scientific, Tustin, California

The well discharge and water level measurement meters were calibrated according to manufacturer's instructions.

Calibrated equipment was uniquely identified by using either the manufacturer's serial number or other means. The results of calibrations and records of repairs were entered in a logbook.

Equipment that failed calibration or became inoperable during use was removed from service and either segregated to prevent inadvertent use or tagged to indicate it was out of calibration.

3.7 LABORATORY PROGRAM

The following sections describe the CH2M HILL laboratory and other laboratories used in the Stage 2-1 Remedial Investigation. Descriptions of analytical methods (including instrumentation used, calibration procedures, analytical interferences, etc.) and the laboratory QA/QC program are provided. Further detail is available in the QAPP.

3.7.1 IDENTIFICATION OF LABORATORIES

The CH2M HILL Redding Environmental Lab is the main contracted lab for analysis of samples from Beale Air Force Base for Stage 2-1 activities. The names, addresses, and telephone numbers of that lab and all labs subcontracted for Beale Stage 2-1 are listed below. All laboratories used are accredited by California Department of Health Services for hazardous waste testing.

CH2M HILL Redding Environmental Laboratory 5090 Caterpillar Road Redding, California 96003 916/244-5227

CH2M HILL Montgomery Environmental Laboratory 2567 Fairlane Drive Montgomery, Alabama 36116 205/271-1444

CH2M HILL Corvallis Office 2300 W. Walnut Boulevard Corvallis, Oregon 97330 503/752-4271 California Analytical Labs 2544 Industrial Boulevard West Sacramento, California 95691 216/372-1393

Enseco Rocky Mountain Analytical Labs 4955 Yarrow Street Arvada, Colorado 80002 303/421-6611

Roy F. Weston 7720 Lorraine Avenue, #105 Stockton, California 95210 209/957-3405

E.A.S. Lab 3576 Empleo, Suite 5 San Luis Obispo, California 93401 805/541-3666

3.7.2 DESCRIPTION OF ANALYTICAL PARAMETERS

3.7.2.1 Analyses Conducted

Analyses conducted for each IRP site varied according to known contaminants at each site, conclusions from previous studies, and identified data needs. Table 3.7.2-1 lists the tests and individual analytes for soils and sediment samples. Table 3.7.2-2 gives similar information for water samples. Not every sample was analyzed for all tests listed in these tables.

3.7.2.2 Instrumentation Used

The following is a list of equipment used by the CH2M HILL Redding Environmental Laboratory during this investigation.

Atomic Absorption Spectrophotometer:
Perkin Elmer 305B flame AA with background correction
Perkin Elmer 5100 Zeeman AA with background correction

Inductively Coupled Plasma Spectrometer Thermo Jerrall Ash ICP61

Table 3.7.2-1 SUMMARY OF QUALITY ASSURANCE FOR SOILS AND SEDIMENT ANALYSES

Parameter Volatile Organics	Met Extrac- tion 5030	hoda Analysis 8240	Detection Limit (mg/kg)	Accuracy (% Recovery)	Precision (Relative 7 <u>Difference</u>)	Complete- ness
	3030	0240		266 1401	e 3.7.3-1	904
Chloromethane Bromomethane			0.1 0.1			
Vinyl chloride			0.1			
Chloroethane			0.1			
Methylene chloride Acetone			0.1 0.1			
Carbon disulfide			0.1			
1,1-Dichloroethene 1,1-Dichloroethane			0.1 0.1			
trans-1,2-Dichloroethene			0.1			
Chloroform			0.1			
1,2-Dichloroethane 2-Butanone			0.1 0.1			
1,1,1-Trichloroethane			0.1			
Carbon tetrachloride Vinyl acetate			0.1			
Bromodichloromethane			0.1 0.1			
1,1,2,2-Tetrachloroethane			0.1			
1,2-Dichloropropane trans-1,3-Dichloropropene			0.1 0.1			
Trichloroethene			0.1			
Dibromochloromethane 1,1,2-Trichloroethane			0.1 0.1			
Benzene			0.1			
cis-1,3-Dichloropropene			0.1			
Bromoform 2-Hexanone			0.1 0.1			
4-Methyl-2-pentanone			0.1			
Tetrachloroethene Toluene			0.1 0.1			
Chlorobenzene			0.1			
Ethyl benzene			0.1			
Styrene Total xylenes			0.1 0.1			
2-Chloroethylvinyl ether			0.1			
Extractable Organics	3550	8270		See Tabl	.e 3.7.3-1	902
2,4-Dinitrophenol			1.60			
4-Nitrophenol Dibenzofuran			1.60 0.33			
2,4-Dinitrotoluene			0.33			
2,6-Dinitrotoluene			0.33			
Diethyl phthalate 4-Chlorophenyl phenyl ether			0.33 0.33			
Fluorene			0.33			
4-Witroaniline 4.6-Dinitro-2-methylphenol			1.60			
4.8-Diditio-2-methylphenol 4-Bromophenyl phenyl ether			1.60 0.33			
Hexachlorobenzene			0.33			
Pentachlorophenol Phenanthrene			1.60 0.33			
Anthracene			0.33			
Di-n-butyl phthalate			0.33			
Fluoranthene Pyrene			0.33 0.33			
Butyl benzyl phthalate			0.33			
3,3'-Dichlorobenzidene Benzo(a)anthracene			0.66 0.33			
bis(2-ethylhexyl)phthalate			0.33			
Chrysene			0.33			
Di-n-octyl phthalate Benzo(b)fluoranthene			0.33 0.33			
Benzo(k) fluoranthene			0.33			
Benzo(a)pyrene			0.33			
Indeno((1,2,3-cd)pyrene			0.33			

Table 3.7.2-1 (Continued)

	Method ^a		Detec- tion		Precision		
_	Extrac-		Limit	Accuracy	(Relative Z	Complete-	
Parameter	tion	<u>Analysis</u>	(mg/kg)	(% Recovery)	Difference)	ness	
Extractable Organics (continued)	3550	8270		See Tabl	le 3.7.3-1	90%	
Dibenzo(a,h)anthracene			0.33				
Benzo(g,h,i)perylene			0.33				
N-Nitrosodimethylamine Phenol			0.33				
bis(2-Chloroethyl) ether			0.33 0.33				
2-Chlorophenol			0.33				
1,3-Dichlorobenzene			0.33				
1,4-Dichlorobenzene			0.33				
Benzyl alcohol 1,2-Dichlorobenzene			0.33 0.33				
2-Methylphenol			0.33				
bis(2-Chloroisopropyl) ether			0.33				
4-Methylphenol			0.33				
N-Nitrosodipropylamine Hexachloroethane			0.33				
Nitrobenzene			0.33 0.33				
Isophorone			0.33				
2-Nitrophenol			0.33				
2,4-Dimethylphenol Benzoic acid			0.33				
bis(2-Chloroethoxy) methane			1.60 0.33				
2,4-Dichlorophenol			0.33				
1,2,4-Trichlorobenzene			0.33				
Naphthalene 4-Chloroaniline			0.33				
Hexachlorobutadiene			0.33 0.33				
4-Chloro-3-methylphenol			0.55				
(para-chloro-meta-cresol)			0.33				
2-Methylnaphthalene Hexachlorocyclopentadiene			0.33				
2,4,6-Trichlorophenol			0.33 0.33				
2,4,5-Trichlorophenol			1.60				
2-Chloronaphthalene			0.33				
2-Nitroaniline Dimethyl phthalate			1.60				
Acenaphthylene			0.33 0.33				
3-Nitroaniline			1.60				
Acenaphthene			0.33				
N-nitrosodiphenylamine			0.33				
<u>Metals</u>							
Aluminum	3050	6010	20	75-125	±20	90%	
Antimony	3050	6010	30	post spike "	,	**	
Arsenic	3050	6010	30	•	m	#	
Barium Beryllium	3050	6010	10	n	"	"	
Cadmium	3050 3050	6010 6010	0.5 1	π π	**		
Calcium	3050	6010	100	n	**	*	
Chromium	3050	6010	3	•	*	#	
Cobalt	3050	6010	4	#		**	
Copper Iron	3050 3050	6010 6010	3 10	n #	# #	#	
Lead	3050	6010	20		π	 #	
Magnesium	3050	6010	100	•	*	#	
Manganese	3050	6010	1.5	#	₩	#	
Mercury (m Molybdenum	ethod) 3050	7471 6010	0.06 4	# #	# #	# #	
Nickel	3050	6010	4	₩	 #	#	
Potassium	3050	6010	as det.	#	#	Ħ	
Selenium	3050	6010	40	**	-	#	
Silver Sodium	3050 3050	6010 6010	3 100	# #	n n	# #	
Thallium	3050	6010	50	**	**		
Vanadium	3050	6010	4	m	•	*	
Zinc	3050	6010	2	•	π	n	

Table 3.7.2-1 (Continued)

Parameter	Metho Extrac- tion A	od• nalysis	Detec- tion Limit (mg/kg)	Accuracy (* Recovery)	Precision (Relative 2 Difference)	Complete-
Pesticides & PCBs	3550	8080		See Tabl	e 3.7.3-1	90%
alpha-BHC beta-BHC delta-BHC delta-BHC gamma-BHC (Lindane) Heptachlor Aldrin Heptachlor epoxide Endosulfan I Dieldrin 4,4'-DDE Endrin Endosulfan II 4,4'-DDD Endosulfan sulfate 4,4'-DDT Endrin ketone Methoxychlor Chlordane Toxaphene AROCLOR-1016 AROCLOR-1221 AROCLOR-1222 AROCLOR-1254 AROCLOR-1254 AROCLOR-1254 AROCLOR-1254			0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.01 0.01 0.01			
Cyanide	SM412b	9010	20	75-125	±20	90%
Waste Analyses						
STLC	California	method	N/A	N/A	N/A	90%
Ignitability		1010	N/A	N/A	N/A	N/A
Percent Moisture	ASA#9, Par Method 7		N/A	N/A	N/A	N/A
Soil pH		9045	N/A	N/A	N/A	N/A
Petroleum Hydrocarbons						
Gasoline Components	California	Method*	1 ppm	50-170	50	902
Diesel Components	California	Method*	1 ppm	50-170	50	90%
Oil and Grease		9071	50	N/A	N/A	N/A

Table 3.7.2-1 (Continued)

Parameter	Metho Extrac- tion A	nalysis	Detec- tion Limit (mg/kg)	Accuracy (Z Recovery)	Precision (Relative Z Difference)	Complete- ness
Site-Specific Analyses						
Dioxins, Furans (all isomers)		8280 ^f	(low level) ^f	ť	r	r
Chlorophenoxy Herbicides						
2,4-D 2,4,5-T Silvex	(method) (method) (method)	8150 8150 8150	0.8 0.1 0.1	20-150 20-150 20-150	50 50 50	90% 90% 90%
Explosives	USATHAMA	4B				8
Nitrobenzene 2, 4-Dinitrotoluene 2, 6-Dinitrotoluene Sym-Trinitrobenzene TNT RDX HMX	USATHAMA USATHAMA USATHAMA USATHAMA USATHAMA USATHAMA USATHAMA MAHTASU	4B 4B 4B 4B 4B 4B	7.0 7.0 10.0 10.0 10.0 5.0	2 2 2 2 2 2	5 E E E E	2 2 2 2 2

*Methods given are EPA SW-846 methods, unless otherwise noted.

U.S. Environmental Protection Agency (EPA), 1986. Test Methods for Evaluating Solid Waste - Physical/Chemical Methods. Office of Solid Waste, U.S. EPA, Washington, D.C. SW-846, Third Edition, 1986.

*American Public Health Association. Standard Methods for the Examination of Water and Wastewater 16th Edition (1985).

California Administrative Code, Title 22, Division 4, Chapter 30, Article 11 Criteria for Identification of Hazardous and Extremely Hazardous Wastes.

American Society of Agronomy, Inc. Methods of Soil Analysis Part 2 Chemical and Microbiological Properties. 2nd Ed., 1982.

*California Regional Water Quality Control Board, Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure. Dec. 1987. Suggested criteria.

Dioxins, furans analysis by modified Method 8280 (SW-846). Analyses were subcontracted and modified method is laboratory specific.

Explosives analysis were subcontracted and method is laboratory specific.

Table 3.7.2-2
SUMMARY OF QUALITY ASSURANCE OBJECTIVES FOR WATER ANALYSES

-			Detection		D	
	Metho	d*	Limit		Precision	Complete-
D. nemes an	Extrac-	Analysis	(ug/l unless given)	Accuracy (% Recovery)	(Relative % Difference)	ness
Parameter Palacashana	<u>tion</u> 5030	8010	f		e 3.7.3-1	90%
Purgeable Halocarbons	3030	8010	1.0	42-172	20	
Bromodichloromethane			1.0 1.0	13-159	33	
Bromoform			1.0	D-144	12	
Bromomethane			1.0	43-143	22	
Carbon tetrachloride			1.0	38-150	24	
Chlorobenzene Chloroethane			1.0	46-137	20	
2-Chloroethyl vinyl ether			1.0	14-186	35	
Chloroform			1.0	49-133	19	
Chloromethane			1.0	D-193	59	
Dibromochloromethane			1.0	24-191	32	
1,2-Dichlorobenzene			1.0	D-208	44	
1,3-Dichlorobenzene			1.0	7-187	38	
1,4-Dichlorobenzene			1.0	42-143	22	
1,1-Dichloroethane			1.0	47-132	19 20	
1,2-Dichloroethane			1.0	51-147	20 29	
1,1-Dichloroethene			1.0	28-167 38-155	24	
trans-1,2,-Dichloroethene			1.0	44-156	23	
1,2-Dichloropropane			1.0	22-178	32	
cis-1,3-Dichloropropene			1.0	22-178	32	
trans-1,3-Dichloropropene			5	25-162	28	
Methylene chloride 1,1,2,2-Tetrachloroethane			1.0	8-184	37	
Tetrachloroethene			1.0	26-162	29	
1.1.1-Trichloroethane			1.0	41-138	22	
1,1,2-Trichloroethane			1.0	39-136	22	
Trichloroethene			1.0	35-146	25	
Vinyl Chloride			1.0	28-163	29	
Purgeable Aromatics	5030	8020				
Benzene			1.0	39-150	24	
Chlorobenzene			1.0	55-135	18	
1,2-Dichlorobenzene			1.0	37-154	25 19	
1,3-Dichlorobenzene			1.0 1.0	50-141 42-143	22	
1,4-Dichlorobenzene			1.0	32-160	27	
Ethylbenzene			1.0	46-148	14	
Toluene Xylenes			1.0	N/A	N/A	
Extractable Organics	3510/3520	8270	50	See Tab	le 3.7.3-1	90%
2,4-Dinitrophenol			50			
4-Nitrophenol			10			
Dibenzofuran			10			
2,4-Dinitrotoluene			10			
2.6-Dinitrotoluene			10			
Diethyl phthalate			10			
4-Chlorophenyl phenyl ether			10 50			
Fluorene			50			
4-Witroaniline			10			
4,6-Dinitro-2-methylphenol 4-Bromophenyl phenyl ether			10			
Hexachlorobenzene			50			
Pentachlorophenol			10			
Phenanthrene			10			
Anthracene			10			
Di-n-butyl phthalate			10			
Fluoranthene			10			
Pyrene			10			
Butyl benzyl phthalate			20			
3,3'-Dichlorobenzidene			10			
Benzo(a) anthracene			10			
bis(2-ethylhexyl)phthalate			10			
Chrysene Di-n-octyl phthalate			10			
Benzo(b) fluoranthene			10			
DEUTO (A) I TROT SUCHENC						

Table 3.7.2-2 (Continued)

Parameter	Metho Extrac- tion	d* Analysis	Detection Limit (ug/l unlessgiven)	Accuracy (2 Recovery)	Precision (Relative % Difference)	Complete- ness
Extractable Organics (Continued)	3510/3520	8270		See Table	3.7.3-1	90%
Extractable Organics (Continued) Benzo(b) fluoranthene Benzo(a) pyrene Indeno((1,2,3-cd) pyrene Dibenzo(a,h) anthracene Benzo(g,h,i) perylene N-Nitrosodimethylamine Phenol bis(2-Chloroethyl) ether 2-Chlorophenol 1,3-Dichlorobenzene 1,4-Dichlorobenzene Benzyl alcohol 1,2-Dichlorobenzene 2-Methylphenol bis(2-Chloroisopropyl) ether 4-Methylphenol N-Nitrosodipropylamine Hexachloroethane Nitrobenzene 1sophorone 2-Nitrophenol 2,4-Dimethylphenol Benzoic acid bis(2-Chloroethoxy) methane 2,4-Dichlorophenol 1,2,4-Trichlorobenzene Naphthalene 4-Chloroaniline Hexachloro-meta-cresol) 2-Methylnaphthalene Hexachlorocyclopentadiene 2,4,6-Trichlorophenol 2,4,5-Trichlorophenol 2-Chloronaphthalene 2-Nitroaniline Dimethyl phthalate Acenaphthylene 3-Nitroaniline Dimethyl phthalate Acenaphthene N-nitrosodiphenylamine	3510/3520	8270	10 10 10 10 10 10 10 10 10 10 10 10 10 1	See Table	3.7.3-1	90%
Aluminum Antimony Arsenic (AA) Arsenic (ICP) Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Iron Lead (AA) Lead (ICP) Magnesium Manganese Mercury Molybdenum Nickel Potassium Selenium (AA)	3005 3005 3005 3005 3005 3005 3005 3005	6010 6010 7060/7061 6010 6010 6010 6010 6010 6010 7420/7421 6010 6010 7471 6010 6010 7740/7741	0.2 mg/l 0.3 mg/l 0.005 mg/l 0.03 mg/l 0.1 mg/l 0.005 mg/l 0.01 mg/l 1.0 mg/l 0.03 mg/l 0.04 mg/l 0.03 mg/l 0.05 mg/l 0.05 mg/l 0.05 mg/l 0.05 mg/l 0.005 mg/l 0.005 mg/l 0.005 mg/l 0.015 mg/l 0.005 mg/l	75-125 75-125	±20 ±20 ±20 ±20 ±20 ±20 ±20 ±20 ±20 ±20	902 902 902 902 902 902 902 902 902 902

Table 3.7.2-2 (Continued)

-	Met Extrac-	hod*	Detection Limit (ug/l unless	Accuracy	Precision (Relative %	Complete-
Parameter	tion	<u>Analysis</u>	given)	(% Recovery)	Difference)	ness
Metals (Continued)						
Selenium (ICP)	3005	6010	0.4 mg/l	75-125	±20	90%
Silver	3005	6010	0.03 mg/1	75-125	±20	90%
Sodium	3005	6010	1.0 mg/1	75-125	±20	90%
Thallium	3005	6010	0.5 mg/1	75-125	±20	90%
Vanadium	3005	6010	0.04 mg/1	75-125	±20	90%
Zinc	3005	6010	0.02 mg/1	75-125	±20	90%
Cyanide	N/A	9010	0.01 mg/l	75-125	±20	90%
Water Analyses						
Temperature	N/A	E170.1	N/A	N/A	±20	90%
pН	N/A	E150.1	N/A	N/A	±20	90%
Specific Conductivity	N/A	E120.1	N/A	N/A	±20	90%
Total Dissolved Solids	N/A	E160.1	3 mg/l	N/A	±20	90%
Anions			_			
Alkalinity, Carbonate						
Bicarbonate	N/A	SM403°	10 mg/l	75-125	±20	90%
Chloride	N/A	E325.3	1 mg/1	75-125	±20	90%
Fluoride	N/A	E340.2	0.05 mg/1	75-125	±20	90%
Sulfate	N/A	E375.4	1 mg/1	75-125	±20	902
Nitrate + Nitrite	N/A	E353.3	0.05 mg/l	75-125	±20	90%
Petroleum Hydrocarbons						
Gasoline Components	Californ	nia Method ⁴	0.5 mg/l	50-150	±50	90%
Diesel Components		nia Method	0.5 mg/l	50-150	±50	90%
Site-Specific Analyses						
COD	N/A	E410.4	7 mg/l	75-125	±20	90%
Dioxins, Furans (all isomers)	8280 ^g		ε	•		
TNT.		USGS	0.8	h	b	h
RDX		USGS	0.6	h	h	h
Picric Acid		USGS	0.2	h	h	h
11010		0000	٧.٤			

^{*}Methods given are EPA SW-846 methods, unless otherwise noted.
U.S. Environmental Protection Agency (EPA), 1986. Test Methods for Evaluating Solid Waste - Physical/Chemical Methods. Office of Solid Waste, U.S. EPA, Washington, D.C. SW-846, Third Edition, 1986.

^bU.S. Environmental Protection Agency. Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020 (USEPA, 1983).

^{&#}x27;American Public Health Association. Standard Methods for the Examination of Water and Wastewater 16th Edition (1985).

⁶California Regional Water Quality Control Board, Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure. Dec. 1987. Suggested criteria.

^{&#}x27;These limits are for <u>advisory purposes only</u>. They are not to be used to determine if a sample should be reanlyzed. When sufficient multilaboratory data are available, standard limits will be calculated.

These limits are for a 20 mg/l concentration.

^{*}Dioxins, furans analysis by modified Method 8280 (SW-846). Analyses were subcontracted and modified method is laboratory specific.

TNT, RDX, Picric Acid analysis were subcontracted and method is laboratory specific.

Gas Chromatography/Mass Spectrometers

Finnigan 5100

Finnigan 4600: EI/CI/PPINICI sources

Super Incos data station

Tekmar ALS, LS II purge and trap concentrator and autosampler

Gas Chromatography

Varian 3700: Hall/PID

Tekmar ALS, LS II purge and trap concentrator and autosampler

Vista 402 data station

Varian 3700: capillary FID, TSD

Varian 8000 autosampler Varian 3700: dual ECD

Varian 8000 autosampler

Varian 600 data station

Varian 9000 autosampler

Dynamic Solutions data system

Ancillary Instrumentation and Equipment:

Bausch & Lomb spectronic 710 UV/Vis spectrophotometer

Beckman specific ion/pH meter

Hach nephelometer

Heat Systems sonicator

Millipore E.P. pressure filter

Mettler analytical balance

O'Haus top-loading balance

Sartorius top-loading balance

Evaporators

Pensky Martens flash point apparatus

Continuous extractors

K-D apparatus

3.7.2.3 Analytical Interferences

Three laboratory interferences were identified during the Stage 2-1 study. First, methylene chloride and acetone were detected in many of the samples, and also in many of the method blanks. These are common laboratory contaminants and are considered false positive results.

Second, a bottle of acetone used in soil extraction was found to be contaminated with phenol. The contamination was discovered in method blanks developed from extraction of kiln-dried pure silica sand (soil blank matrix) and was estimated to be 1.7 mg/kg phenol. Approximately 57 surface soil and soil boring samples that came from sites 2, 3, 6,

9, 13, 16, 18, 19, and 20 were affected by this false positive result.

Third, thallium was detected in some soil samples. The thallium results are false positive results due to an interference problem (primarily with titanium) in the ICP metals analysis. Analysis of thallium by ICP suffers from spectral interferences from titanium which is not a reported analyte for ICP metals analysis. The interferences occur on both sides of the spectral bandwidth, and are difficult if not impossible to correct when the concentration of thallium is low compared to the concentrations of the interferents.

Fourth, toluene was detected in a majority of soil samples and many of the water samples throughout the base. This is probably a false positive result that may be related to the electrical tape used to seal the caps on the brass soil sample tubes. AeroVironment, the previous IRP contractor at Beale AFB, also has false positive results for toluene (AeroVironment, 1987, page III-48). They performed an experiment putting a 2-inch piece of electrical tape in a vial of organic-free water and analyzing the water for volatile organic compounds by EPA Method 601/602. The analysis showed high levels of toluene, but no other volatile organic compounds were detected.

Additional analytical interferences are discussed in Section 4, within individual site discussions.

3.7.3 LABORATORY QA/QC PROGRAM

This section summarizes the QA/QC procedures used by CH2M HILL during this investigation.

3.7.3.1 Establishment of Detection Limits

Maximum required detection limits are established by the USAF for the IRP program in the IRP Analytical Protocols Handbook (USAF, 1988b). Tables 3.7.2-1 and 3.7.2-2, given in the previous section, list the standard detection limits for all analytes.

In some cases, actual detection limits varied from those listed in the tables. Lower detection limits were achieved for some tests, but matrix interferences and required dilutions often resulted in higher detection limits for organic analyses. The analytical results given in Appendix A list the detection limits achieved for each sample and detected analyte, as well as dilution factors.

The limits of quantification (LOQ) are the detection limits given in Appendix A. Some analytes were tentatively identified below the LOQ and are flagged with a "J". This indicates that the analyte is believed to be present at low concentrations, but the concentration cannot be accurately determined with confidence.

3.7.3.2 Frequency and Type of Laboratory QA/QC Data

The following section describes the laboratory QA/QC sample program, sample frequency, and corrective actions. QA/QC data for surrogate spike receivers are presented with the sample analysis results and field QC results in Appendix A. Other supporting QA/QC data, including method blanks, matrix spikes, matrix spike duplicates, and trip blanks, are given in Appendix F.

3.7.3.2.1 Method Blank Analyses

A method blank is a "clean" sample (i.e., containing no analyte of concern), most often distilled water, to which all reagents and analytical procedures are performed. Method blanks are analyzed at a rate of one per sample lot or at least every 20 samples or batch if less than 20. The blank is analyzed in order to assess possible contamination from the laboratory so that corrective actions may be taken, if necessary.

Corrective Actions--the method blank results should contain no greater than method detection limits. If high blank values are observed, laboratory glassware and reagents should be checked for contamination and the analysis halted until the system can be brought under control.

3.7.3.2.2 Surrogate Spike Analyses

For certain analyses, such as GC/MS, each sample and blank is spiked with one or more "surrogate" compounds prior to preparatory operations such as purging or extraction. These surrogate standards are chosen so as to have properties similar to sample analytes of interest, but are most likely absent from the natural sample. This procedure is used to evaluate the efficiency of the analytical procedure to recover the true amount of a known compound.

Corrective Actions--the results of surrogate standard determinations are compared with the true values spiked into the sample matrix prior to extraction and analysis, and the percent recoveries of the surrogate standards are determined.

Recoveries should meet the upper and lower control limits as specified for each compound. If control limits are exceeded for surrogate standards, the following sequence of actions are taken:

- o Calculations are checked to be sure that there are no errors.
- O Internal standards and surrogate spiking solutions are checked for degradation, contamination, or solvent evaporation.
- o Instrument performance is checked.
- o If the above measures fail to reveal the cause of the non-compliant surrogate recoveries, the sample is repurged or re-extracted.
- o If all the measures listed above fail to correct the problem for laboratory blank surrogate analyses, the analytical system is considered out of control, and must be recalibrated and examined for mechanical faults.
- o If all the measures listed above fail to correct the problem for field sample surrogate analyses, the deficiency is probably due to sample interferences, and not due to any procedural or mechanical problems in the laboratory. The surrogate spike recovery data and the sample data from both extractions are reported.

3.7.3.2.3 Matrix Spike/Matrix Spike Duplicate Analyses

To evaluate the effect of the sample matrix upon analytical methodology, two separate aliquot samples are spiked with a standard mix of compounds appropriate to a given analysis. The matrix spike/matrix spike duplicate (MS/MSD) are analyzed at a frequency of one per lot or one per 20 samples, whichever is more frequent. The percent recovery for the spiking compounds is calculated. The relative percent difference (% RPD) between the MS/MSD is also calculated.

Corrective Actions--the observed percent recoveries and % RPD between the MS/MSD are used to determine the accuracy and the precision of the analytical method for the sample matrix. If the percent recovery and % RPD results exceed the control limits as specified for each spiking compound, the sample will not be re-analyzed. The reason is that poor

recovery in matrix spiked samples does not necessarily represent an analytical system out of control. It is possible that unavoidable interferences from the sample itself preclude efficient recoveries.

3.7.3.2.4 Internal Standards Analyses

Once an instrument has been calibrated, it is necessary to confirm periodically that the system remains in calibration. This is done each time analyses are performed by the use of appropriate internal standards added at a frequency consistent with the method being used. When internal standard addition is not appropriate to a particular method, other means of accuracy checks, such as standard addition are used. Results from internal standard analyses are entered on an accuracy control chart and compared to the mean calibrated value.

Corrective Actions--deviation from this mean beyond a predetermined magnitude, depending on the type of analysis, defines an out-of-control condition. The system must then be brought back into control by:

- Checking the quality of the internal standards and reanalyzing the sample
- o Recalibrating the system
- O Correcting the malfunctions causing the instrument to fall out of calibration

3.7.3.2.5 Duplicate Sample Analyses

Duplicate analyses are performed to evaluate the reproducibility of the method. Results of the duplicate analyses are used to determine the relative percent difference (% RPD) between replicate samples. For each parameter analyzed, at least one duplicate sample is tested per group of 20 samples or batch if less than 20.

Corrective Actions--the precision value, % RPD, should be reviewed by the QA Coordinator and department manager. If the precision value exceeds the control limit for the given parameter, the sample set should be reanalyzed for the parameter in question.

3.7.3.2.6 Check Standard Analyses

Analysis of check standards is used to verify the standard curve and shall be performed with each group of samples. Results of these data shall be summarized, evaluated and presented to the Laboratory Manager and QA Coordinator for review.

Corrective Actions--the results of check standard analysis are compared with the true values and the percent recovery of the check standard is calculated. If correction is required, the check standard shall be reanalyzed to demonstrate that the corrective action has been successful.

3.7.3.2.7 Performance Evaluation Standards Analyses

Performance standards serve as an accuracy check of laboratory operations and measurement systems by comparing CH2M HILL results with those of other laboratories. CH2M HILL routinely receives performance evaluation samples and standards from numerous performance audit programs such as EPA's Contract Laboratory Program (CLP); EPA's NPDES program; Florida's DER Round Robin program; etc. The results from these samples are reviewed by the Laboratory Manager, department managers, and the Quality Assurance Coordinator.

Corrective Actions—the results from the performance standards and the blind QC samples are reviewed by the Laboratory Manager, department manager, and QA coordinator. If the laboratory fails in its ability to perform acceptably on these samples, the entire analytical measurements process should be examined to ascertain why the errors were obtained. The corrective actions identified should be taken by the laboratory immediately.

3.7.3.3 Establishment of QA/QC Sample Control Limits

Control limits for precision, accuracy, and completeness are given in Tables 3.7.2-1 and 3.7.2-2 (previously given), and in Table 3.7.3-1.

For the Stage 2-1 activities at Beale AFB, the laboratory had responsibility to notify the Project Manager, in writing, should out-of-control conditions occur. The actions taken to correct the situation were also to be reported. Individual out-of-control conditions are discussed in Section 4 of this report, on a site-specific basis.

Table 3.7.3-1 RECOVERY LIMITS

SURROGATE SPIKE RECOVERY LIMITS

	-	Low/Medium Water	Low/Medium Soil/Sediment
Fraction	Surrogate Compound	7 Recovery	2 Recovery
Volatiles	Toluene-de	88-110	81-117
	4-bromofluorobenzene	86-115	74-121
	1,2-dichloroethane-d4	76-114	70-121
Semivolatiles	Nitrobenzene-ds	35-114	23-120
	2-fluorobiphenyl	43-116	30-115
	p-terphenyl-d ₁₄	33-141	18-137
	Phenol-d.	10-94	24-113
	2-fluorophenol	21-100	25-121
	2,4,6-tribromophenol	10-123	19-122
Pesticides	(Dibutylchlorendate) 4	(24-154)*	(20-150)*
Purgeable			
Halocarbons	Bromochloromethane	70-130	N/A
Purgeable			
Aromatics	ααα-trifluorotoluene	70-130	N/A

MATRIX SPIKE RECOVERY AND PRECISION LIMITS

		Water	•	Soil/Sediment	
Fraction	Matrix Spike Compound	Recovery	RPD°	Recovery	RPD°
Volatiles	1,1-dichloroethene	61-145	14	59-172	22
	Trichloroethene	71-120	14	62-137	24
	Chlorobenzene	75-130	13	60-133	21
	Toluene	76-125	13	59-139	21
	Benzene	76-127	11	66-142	21
Semivolatiles	1,2,4-trichlorobenzene	39-98	28	38-107	23
	Acenaphthene	46-118	31	31-137	19
	2,4-dinitrotoluene	24-96	38	28-89	47
	Pyrene	26-127	31	35-142	36
	N-nitroso-di-n-propylamine	41-116	38	41-126	38
	1,4-dichlorobenzene	36-97	28	28-104	27
	Pentachlorophenol	9-103	50	17-109	47
	Phenol	12-89	42	26-90	35
	2-chlorophenol	27-123	40	25-102	50
	4-chloro-3-methylphenol	23-97	42	26-103	33
	4-nitrophenol	10-80	50	11-114	50
Pesticides	Lindane	56-123	15	46-127	50
	Heptachlor	49-131	20	35-130	31
	Aldrin	40-120	22	34-132	43
	Dieldrin	52-126	18	31-134	38
	Endrin	56-121	21	42-139	45
	4,4'-DDT	38-127	27	23-134	50

^{*}These limits are for advisory purposes only. They are not used to determine if a sample should be reanalyzed. When sufficient data become available, the USEPA may set performance-based contract-required windows.

These limits are for <u>advisory purposes only</u>. They are not to be used to determine if a sample should be reanalyzed. When sufficient multi-laboratory data are available, standard limits will be calculated.

^{&#}x27;RPD = Relative percent difference.

⁴Dibutylchlorendate is not commercially available; another substitute will have to be used if necessary.

3.7.3.4 Reference to Appendixes

As stated previously, chemical analysis data are reported in Appendix A. Also included in that appendix are results for field replicate samples, field blanks, ambient condition blanks, and equipment use blanks. Surrogate spike recoveries are reported in association with each organic analysis within Appendix A.

Appendix F contains supporting QA/QC data including method blank results, trip blank results, and matrix spike/matrix spike duplicate results.

IV. RESULTS AND SIGNIFICANCE OF FINDINGS

4.1 Discussion of Results

This section presents the results and findings for IRP Stage 2-1 activities at Beale AFB. The results include discussions of site geology and hydrogeology, analytical results, sample and analytical problems, and significance of findings. These items are discussed individually for each of the IRP sites. Even though several of the sites did not receive actions under Stage 2-1, subsections are included within this section in order to explain the current status of these sites in the IRP and to preserve the section numbering system.

Within this section, site discussions begin with three-digit headings (e.g., 4.1.1) where the third digit corresponds to the IRP site number. Each site discussion begins on a new page so that the results section may be separated into individual sites for evaluation, if desired.

Several important points should be noted regarding Section IV. These are:

- 1. Included in Section 4.1 are both statements of factual results, interpretations of these results, and development of conclusions regarding the physical and chemical status of each IRP site. These results are based primarily on information collected by CH2M HILL during IRP Stage 2-1 activities, but also include information collected during previous IRP work and related information provided by Beale AFB personnel. As the IRP progresses at Beale AFB, additional data will become available that may modify the conclusions in this report.
- 2. To determine the "significance of findings," it is necessary to interpret results and discuss those results that are most meaningful, according to best professional judgement. One example of this is the discussion of chemical analytes detected. For each site where samples were taken, all analytes detected are reported in the Analytical Results Table within each site discussion and in Appendix A. The text sections, figures, and other tables, however, discuss or present analytes that are interpreted to be indicators of site-specific contaminants. Omission of certain contaminants from text discussions or figures and tables does not imply that these compounds are unimportant. Until the time that risk assessments are completed for each site, all

- analytes detected, except for those shown to be false positive results, or metals detected at or below background levels, must be considered significant.
- Discussions about the concentrations of metals detected in soil samples have been compared to the natural background concentrations of these metals. To make this comparison, the concentrations of 17 metals in 31 samples collected from 6 background soil borings (Sites 2, 3, 6, 13, 15, and 19) were averaged. A distribution of two standard deviations about the mean was calculated for each metal. Table 4.1-1 presents the results for this assessment of background metals. Discussions within the following sections compare soil metal concentrations in site samples to the background range, which has arbitrarily been set as the two standard deviation range. Natural variability of metals in soils at Beale AFB will probably cause some sample results to exceed this background range. The presence of one or more metals at levels exceeding the background range should not automatically be interpreted as a contamination impact. Soil and groundwater background results are discussed further in Section 4.1.25.
- 4. This report contains data for all soil, groundwater, and surface water samples collected in Stage 2-1.
- 5. Stage 2-1 investigations included subsurface soil sampling using both vertical and angled borings. The text and site maps in the following sections discuss which borings were angled and which were vertical. Field notes and the depths at which samples were collected were recorded in terms of footage drilled, not corrected vertical footage. Because all of the field notes and analytical data are given as footage drilled, that is the format followed in this report. The text refers to the drilled depth and gives the true vertical depth in parentheses. Because all angled borings were drilled at 30 degrees from vertical, drilled depths can be converted to true depths by multiplying times 0.87.
- 6. California total fuel hydrocarbon (TFH)-diesel and -gas analyses have been performed for selected soil and water samples. The TFH analyses detect aliphatic (straight-chain hydrocarbons) and aromatic constituents (hydrocarbons made up of one or more benzene rings) contained in fuel. Detection is reported as the sum total of all hydrocarbons in the sample, rather than as individual chemicals. The TFH-diesel analysis focuses on aliphatic hydrocarbons ranging in length from C10 to C23, the TFH-gas analysis on hydrocarbon lengths ranging from C4 to C12 (State Water Resources Control Board,

Table 4.1-1 ICP METAL CONCENTRATIONS BASEWIDE BACKGROUND AVERAGES

ICP Metal		Standard Deviation (mg/kg)	Range of 2 Standard Deviations About the Mean (mg/kg)	No. Detected/ No. of Samp es
Aluminum	14,186	1,720	10,746-17,626	31/31
Barium	149	48	53-245	31/31
Beryllium	"			1/31
Calcium	5,003	562	3,879-6,127	31/31
Cobalt	25	15	0-55	31/31
Chromium	31	8	15-46	31/31
Copper	44	12	21-67	31/31
Iron	25,843	3,925	17,993-33,692	31/31
Magnesium	5,480	674	4,133-6,827	31/31
Manganese	815	214	387-1,243	31/31
Nickel	23	4	15-31	31/31
Lead	 5		es en	1/31
Potassium	551	210	131-970	28/31
Sodium	234	96	42-426	31/31
Vanadium	70	18	33-107	31/31
Zinc	57	7	43-70	31/31

^{*}Only ICP metals detected at least once in background

borings are presented in this table.
Beryllium was detected in only one sample at 0.62 mg/kg and lead was detected in only one sample at 24.2 mg/kg.
Because these elements were detected in only 1 of 31 samples, calculation of a mean is not valid.

1989). The Leaking Underground Fuel Tanks (LUFT) Field Manual presents a method for developing sample-specific cleanup standards which it refers to as a Leaching Potential Analysis. This analysis considers the depth to groundwater, rainfall, local geology, and site-specific features to derive standards for TFH-gis, TFH-diesel, benzene, toluene, total xylenes and ethyl benzene (State Water Resources Control Board, 1989).

The intent of the LUFT field manual is that these standards be used as guidelines to assess the need for or scope of additional investigations or remediation at leaking underground fuel tank sites. Only one IRP site for which TFH analyses were conducted contains underground fuel tanks (Site 3). However, because TTLC values have not been established for TFH-gas, TFH-diesel, benzene, toluene, xylenes or ethyl benzene, sample results are compared to standards derived from a Leaching Potential Analysis for purposes of discussion. Where sample concentrations exceed derived standards, it should not automatically be assumed that additional investigation or remediation is required. TTLC and STLC values are not considered cleanup levels. Cleanup levels will eventually be determined by a risk assessment process which incorporates site specific public health and ecological based exposure data.

7. A number of compounds were detected at low levels in many soil and water samples which are either common laboratory-induced contaminants, false positives due to laboratory- or field-induced contamination, or false positive results due to interference problems in the analytical method used.

Methylene chloride, acetone, and phthalate compounds are common laboratory contaminants, and they are considered to be false positive results where they were detected. Phenol contamination occurred in a total of 57 surface soil and soil boring samples that came from Sites 1, 2, 3, 6, 9, 13, 16, 18, 19, and 20. This phenol has been traced to a factory-contaminated bottle of reagent grade acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks affected by this contamination that the average induced contamination was 1.7 mg/kg.

Thallium was detected in some soil samples. The thallium results are false positive results due to an interference problem (primarily with titanium) in the ICP metals analysis. Analysis of thallium by ICP suffers from spectral interferences from titanium which is not a reported analyte for ICP metals analysis. The interferences occur on both

sides of the spectral bandwidth, and are difficult if not impossible to correct for when the concentration of thallium is low compared to the concentrations of the interferents.

Toluene was detected at low levels in many samples. While toluene is not a common laboratory contaminant, its ubiquitous extent and the poor reproducibility of the toluene results suggest that it is a false positive result. Toluene detections may be related to the electrical tape used to wrap soil and water samples as specified in the work plan. Where true environmental contamination with toluene is believed to be present, it is discussed on a site-by-site basis.

8. Newly installed monitoring wells at Beale AFB were given short-term pump tests to provide an estimate of yield and furnish a picture of geologic conditions in the immediate vicinity of the well. In addition, well 19-C-4 was given a 72-hour drawdown test and a 72-hour recovery test to supply an estimate of aquifer parameters that affect groundwater flow velocity. Plots of the pump tests are provided in Appendix E, along with a discussion of methodology. A discussion of hydrogeology at Beale AFB is presented in Section 2.

The groundwater system at Beale AFB is characterized by its alluvial geologic setting, in which isolated coarse-grained stream channel deposits are contained within a matrix of fine-grained overbank deposits. There is no "aquifer" in a textbook sense. Groundwater tends to flow in relatively more permeable lenticular clayey and silty sands contained within a complex assemblage of sandy clays and sandy silts. Thus, rather than identifiable aquifers that may be correlated from place to place, the groundwater may be considered to flow in a single, large-scale heterogeneous system.

In such a setting, pump tests must be regarded as indicators of the yield of the well, as estimates of hydrologic conditions, and as a descriptive tool to help define the subsurface geology. Historically, groundwater analytical techniques have been developed using simplifying assumptions. These include such assumptions as that aquifers and groundwater flow paths are horizontal, are bounded by units capable of being described mathematically, are infinite in areal extent, are of constant thickness, and are homogeneous and isotropic.

Although techniques have been developed that deal with some departure from the simplified assumptions described above, no analytical technique fully addresses a system as complex

as that at Beale AFB. In this situation, it was decided to employ standard methods of pump test analysis, while recognizing that results are only estimates. The test that most accurately portrays subsurface groundwater conditions at Beale AFB was the 72-hour test performed at well 19-C-4, which tended to average out local heterogeneities. Estimates of groundwater flow velocity presented in this report were made using the value of hydraulic conductivity derived from this test. Short-term pump test results are indicative of hydrogeologic conditions in the immediate vicinity of the well screen, and are useful as estimates of yield for sampling purposes and to show hydraulic communication among nearby wells.

9. The discussion for each site in Section 4 contains subsections that address the rate and direction of migration based on hydrogeological properties and the time of travel to receptors. As described above, velocity calculations were made using the value of hydraulic conductivity obtained from the 72-hour drawdown and recovery test performed in well 19-C-4. It should be remembered that the hydrogeological regime at Beale AFB is extremely variable, and that hydraulic conductivity may also vary from the value obtained at well 19-C-4. For example, there are some indications that subsurface materials in the northern part of Beale AFB may be relatively more permeable than in the southern part, where well 19-C-4 is located.

Groundwater velocity is also directly variable with the hydraulic gradient. Calculations presented in this section use local gradients wherever possible. However, this gradient also varies from place to place.

Groundwater velocity finally varies inversely with the effective porosity of the materials through which it is flowing. Because of the extreme variability of the geology, the effective porosity will also change dramatically from place to place. On the assumption that contaminants will migrate preferentially through relatively more permeable materials, an effective porosity of 0.20 was assumed in the calculations.

Many other factors affect the rate at which contaminants migrate with groundwater. Physical factors include such phenomena as dispersion and diffusion along the flow path. Chemical factors include phenomena as adsorption of contaminants on geologic materials, precipitation, reactions with other chemicals and soil minerals, and the oxidation or reduction of the contaminants themselves. Microbiological degradation may attenuate the levels of contamination.

Calculations presented here assumed that contaminants exhibited advective flow; e.g., that they flowed at the same rate as the groundwater.

However, the mobility of contaminants is extremely complex, and depends on a wide variety of hydrological and biochemical conditions. Precise calculation of all the variables influencing flow at Beale AFB is nearly impossible, and certainly beyond the scope of this investigation. Statements in Section 4 describing groundwater flow velocities and potential time of travel to receptors should be regarded as estimates only.

4.1.1 DISCUSSION OF RESULTS FOR SITE 1: WEST DRAINAGE DITCH

Site 1 drains runoff originating from the flightline area about 2,000 feet east of Site 1. The runoff passes through a series of 66-inch culverts which discharge through a headwall about 800 feet west of the main runway into the West Drainage Ditch. Since 1984, oil absorbent booms have been placed immediately downstream from the headwall. The booms are periodically replaced.

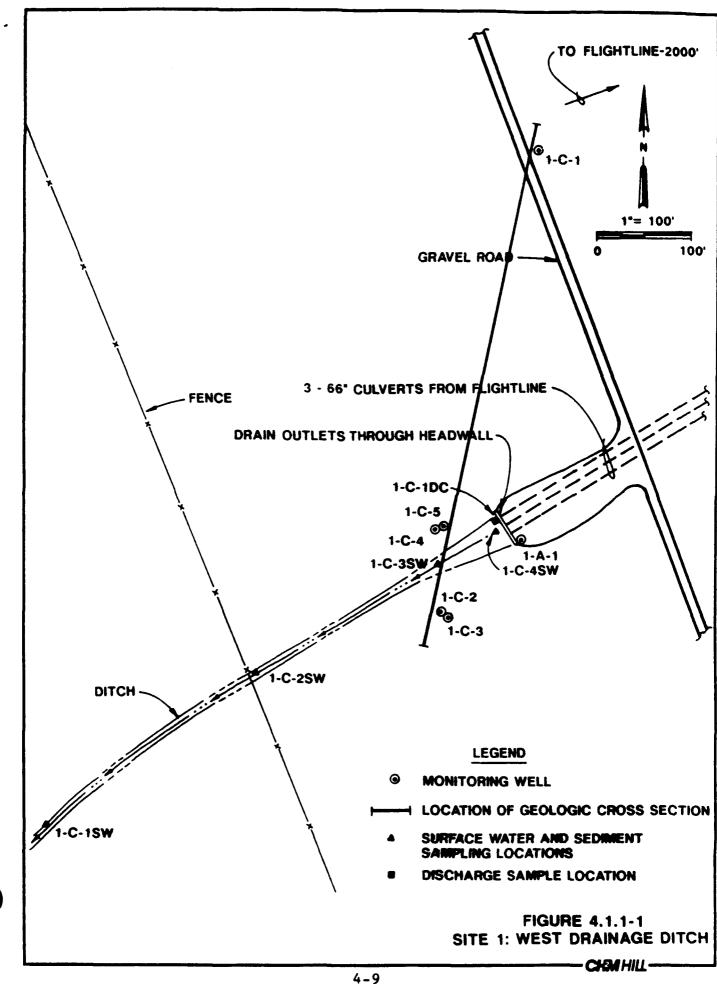
Runoff from the West Drainage Ditch originates at a drainage channel at Site 10, the J-58 Test Cell at the east end of Grumman Avenue, east of Doolittle Drive (Plate 1). The channel runs west underneath Doolittle Drive into two 60-inch-diameter storm drains. Fuel has been observed by Beale AFB personnel in the drains east of Arnold Avenue. Runoff from maintenance buildings near Sites 4 and 11 and hangars joins the double drains at Arnold Avenue. Runoff from the taxiways and SR-71 shelters (Site 5) enters the double drain west of the shelters. Runoff from the runway and grassy areas east of the runway, including Site 21, enters the drain east of the runway. Here the drain transitions to three 66-inch CMP culverts which flow west and discharge to the West Drainage Ditch.

During the Stage 2-1 study, water discharging to the ditch was sampled quarterly for 1 year. Surface water within the ditch was also sampled quarterly at four locations along the ditch (Figure 4.1.1-1).

Surface sediment samples were collected from four cross sections of the ditch downstream from the headwall. At each cross section, two different depth interval samples were obtained from three hand-augered holes. A total of 24 samples were collected. Section points were one on each bank and one at near the center line of the ditch. Sample depths were zero to 0.5 feet and 1.5 to 2.0 feet.

Five new wells were constructed at Site 1 as part of Stage 2-1 activities. These wells, plus one existing well, were sampled quarterly for a period of 1 year. Two existing off-base domestic wells were sampled during the third and fourth sampling rounds.

During sediment and surface water sampling in the west drainage ditch, it was noted that the ditch had recently been dredged from immediately west of the headwall to beyond the most western surface sample locations. Evidence of a backhoe or track-mounted scoop was observed. The bottom of



the ditch, in a hard pan clay, had scrape marks from the bucket; track marks were visible on the ground surface north of the ditch, and sediment was piled on plastic sheeting about 50 feet north of the ditch. The sediment contained reeds and roots. Samples from this material were not collected.

4.1.1.1 Presentation of Results

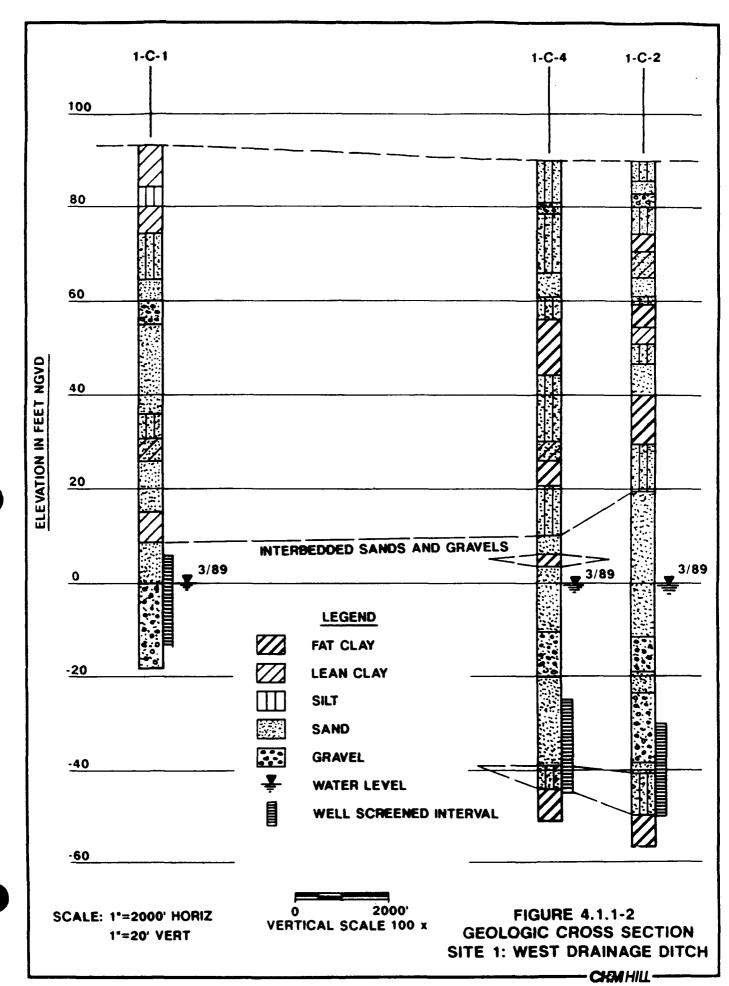
4.1.1.1.1 Site Geology

Evaluation of local geology at Site 1 is based on drilling activities completed during the Stage 2-1 Remedial Investigation and previous IRP studies. There are now six monitoring wells:

- o Background well 1-C-1 northeast of the ditch is a shallow well screened across the water table from about 86 to 106 feet BGS (7 to -13 feet NGVD).
- o Shallow well 1-A-1 at the headwall installed during previous studies and screened across the water
 table from about 98 to 118 feet BGS (-6 to
 -26 feet NGVD).
- One pair south of the ditch consisting of shallow well 1-C-3 screened across the water table from 85 to 105 feet BGS (5 to -15 feet NGVD), and deep well 1-C-2 screened from 120 feet to 140 feet BGS (-31 to -51 feet NGVD).
- One pair north of the ditch consisting of shallow well 1-C-5 screened across the water table from 85 to 105 feet BGS (5 to -15 feet NGVD) and deep well 1-C-4 screened from 115 to 135 feet BGS (-25 to -45 feet NGVD) (see Figure 4.1.1-1).

Well logs are in Appendix D.

A geologic cross section was prepared from the soil boring logs of monitoring wells 1-C-1, 1-C-2, and 1-C-4. The location of this cross section is shown on Figure 4.1.1-1. The cross section, Figure 4.1.1-2, shows that geologic materials at Site 1 are an alluvial sequence consisting primarily of silty sands, sands, and gravels. Although it is difficult to make correlations in materials in the upper levels of the boreholes, a reasonably good correlation may be made among coarse-grained deposits that occur at depth. A thick sequence of sands and gravels occurs in each of the boreholes, beginning at 70 to 85 feet below grade (5 to 20 feet NVGD),



and extending down to 135 to 140 feet (-45 to -50 feet NVGD). A stiff clay underlies the sand and gravel in deep wells 1-C-2 and 1-C-4.

Subsurface materials at Site 1 have been assigned to the Victor Formation by Page (1980). This formation comprises continental deposits of silt, sand and gravel, with minor amounts of clay and layers of cemented sediments. Volcanic sediments were not found at Site 1. Rather, cobbles and gravel were composed of clasts of granodiorite. Soils were mapped as Perkins loam along the drainage and San Joaquin loam across the remainder of Site 1 (SCS, 1985).

4.1.1.1.2 Site Hydrogeology

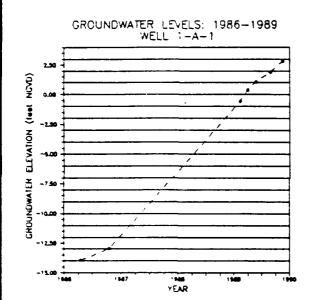
Near-surface groundwater at Site 1 appears to flow under unconfined conditions. During drilling, the first contact with groundwater was immediately observable because the near-surface groundwater at Site 1 flows through highly permeable, coarse-grained materials. The clay unit observed in the bottom of wells 1-C-2 and 1-C-4 appears to form a basal boundary of relatively lower permeability. The unconfined aquifer above the clay has a saturated thickness of about 45-50 feet beneath Site 1. The areal extent of the aquifer and the clay base is unknown.

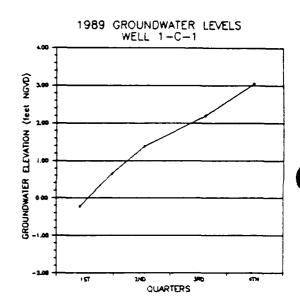
Table 4.1.1-1 and Figures 4.1.1-3 and 4.1.1-4 present groundwater level data collected during Stage 2-1. These data show that the water table rose about 3 feet between February and November 1989. Comparison to measurements made by AeroVironment (1987) shows that water levels in well 1-A-1 have risen about 17 feet between April 1986 and November 1989. A similar rise in groundwater was observed in other monitoring wells on the western edge of the base and in wells monitored by DWR west of Beale AFB.

Figure 4.1.1-5 presents groundwater contours plotted at Site 1 from elevations measured in May 1989. Figure 4.1.1-6 presents groundwater contours for the north side of Beale AFB, also based on the May 1989 elevations. Plates 3 and 4 present groundwater contours for all of Beale AFB based on March and November 1989 measurements. Groundwater elevations from wells screened across the uppermost permeable zone are illustrated in these figures. Figure 4.1.1-5 shows that groundwater is flowing to the southwest at an average gradient of about 0.0016. This flow direction is apparently influenced by the groundwater depression west of Beale AFB. Groundwater elevations from paired wells 1-C-2 and 1-C-3, and 1-C-4 and 1-C-5 demonstrate that there is no detectable vertical gradient beneath Site 1, supporting the

Table 4.1.1-1
GROUNDWATER ELEVATIONS: SITE 1
(FEET NGVD)

<u>Well</u>	Screened Interval	Apr. Oct. 1986 1986	Feb. 1989	March 1989	May 1989	Aug. 1989	Nov. 1989
1-A-1	-6 to -26	-13.95 -12.95	-0.75	0.38	1.08	1.88	2.80
1-C-1	7 to -13		-0.47	0.65	1.38	2.19	3.05
1-C-2	-31 to -51		-0.94	0.21	0.87	1.67	2.62
1-C-3	5 to -15		-0.97	0.19	0.87	1.66	2.62
1-C-4	-25 to -45		-0.93	0.23	0.89	1.70	2.64
1-C-5	5 to -15		-0.86	0.29	0.97	1.76	2.70



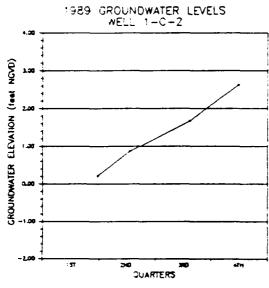


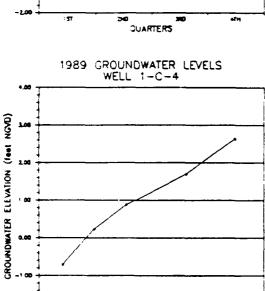
NOTE: VARYING TIME SCALES

FIGURE 4.1.1-3

MONTORNG WELL HYDROGRAPH SITE 1: WEST DRAINAGE DITCH

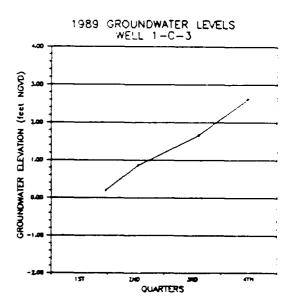
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QUARTERS

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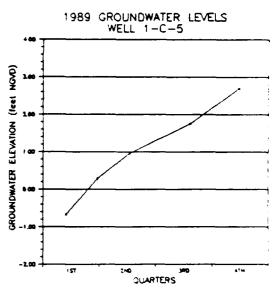
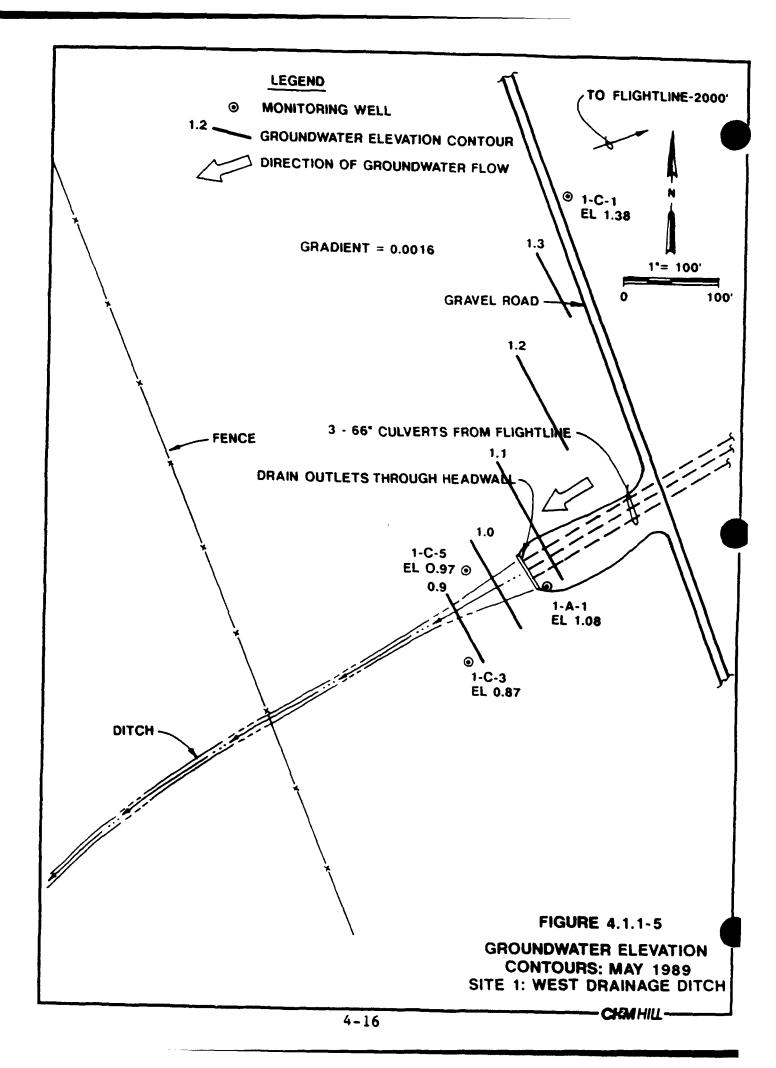
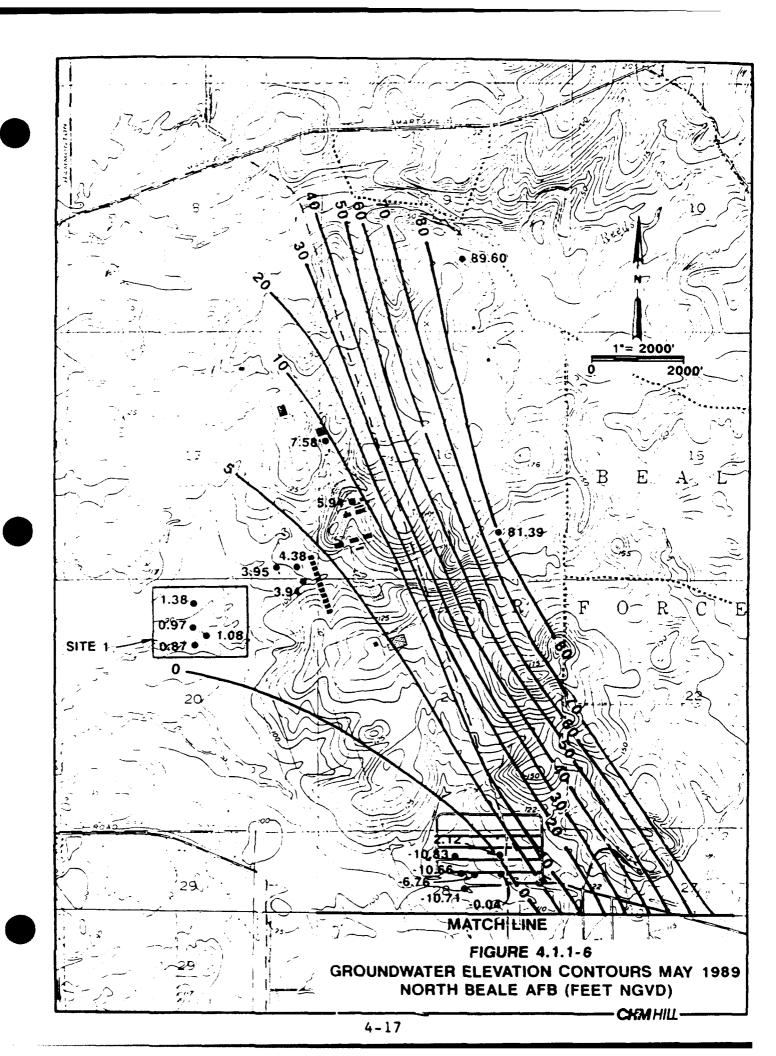


FIGURE 4.1.1-4

MONITORING WELL HYDROGRAPH SITE 1: WEST DRAINAGE DITCH

CHM HILL-





interpretation of a highly permeable unconfined near-surface aquifer system in the vicinity of Site 1. However, plots of pump tests performed on Site 1 wells showed indications of nearby geologic units of relatively lower permeability. These plots are contained in Appendix E.

Table 4.1.1-2 summarizes results of aquifer tests performed on Site 1 wells. This table shows that the average value of transmissivity obtained from the tests was about 110,000 gallons per day per foot, or about 14,000 square feet per day. The average value obtained for hydraulic conductivity was about 340 feet per day (0.12 cm/sec). These relatively high values are representative for coarse sands and gravels. The mean specific yield derived from the tests was 0.023, a value in the expected range for an unconfined aquifer (Freeze and Cherry, 1979). Plots of the aquifer test data and a discussion of testing methodology are provided in Appendix E.

The average linear velocity of groundwater flow may be estimated by the following form of Darcy's Law:

V = Ki/n
where:

V = Average linear velocity of groundwater flow (L/T)

K = Hydraulic conductivity (L/T)

i = Hydraulic gradient (L/L)

n = Effective transport porosity (dimensionless)

The value of hydraulic conductivity derived during the 72-hour pump test at well 19-C-1 is used for estimates of groundwater velocity. Using the hydraulic conductivity value derived from this test of 28 feet per day, the measured hydraulic gradient of 0.0016, and an estimated effective transport porosity of 0.20, the approximate velocity of groundwater movement near Site 1 is about 0.22 feet per day or about 82 feet per year. This low velocity reflects the low groundwater gradient near Site 1.

If the higher value of hydraulic conductivity obtained in Site I pump tests had been used in the calculations, the resulting groundwater velocity would be higher (nearly 1,000 feet per year). However, pump test plots collected in Appendix E reveal the presence of geologic materials of lower permeability in the vicinity of Site 1. As mentioned previously, velocity calculations are only estimates.

4.1.1.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality

Table 4.1.1-2 SUMMARY OF SITE 1 PUMP TEST RESULTS (Cooper-Jacob Method)

Well	Date	Pumping or Observation Well	DD*	T ^b (gpd/ft)	$\frac{T}{(ft^2/d)}$	B ^c (ft)	K ^d (ft/d)	_S*
1-C-1	1/26	P	DD	33,000	4,400	12.4	350	
	1/26	P	R	31,000	4,200	12.4	340	
1-C-3	2/7	P	DD	69,000	9,200	46	200	
	2/7	P	R	73,000	9,800	46	210	
1-C-4	2/9	P	DD	96.000	13,000	46	280	
	2/9	P P	R	130,000	18,000	46	380	
1-C-2	2/9	0	DD	170,000	22,000	46	480	0.0092
	2/9	0	R	170,000	22,000	46	480	
1-C-3	2/9	0	DD	190.000	26,000	46	560	0.018
	2/9	0	R	170,000	23,000	46	500	
1-A-1	2/9	0	DD	47,000	6,200	46	140	0.068
1-C-1	2/9	0	DD	43,000	6,000	46	130	0.018
1-C-5	3/6	P	R	84,000	11,000	47	240	
1-C-2	3/7	P P	DD	130,000	17,000	47	370	
	3/7	P	R	120,000	15,000	47	350	
1-C-4	3/7	0	QQ	120,000	16,000	47	330	0.008
	3/7	0	R	110,000	14,000	47	300	
1-C-5	3/7	0	DD	140,000	18,000	47	390	0.017
	3/7	0	R	140,000	18,000	47	390	
		Mean		110,000	14,000		340	0.023

^{*}DD = Drawdown test; R = Recovery test

T = Transmissivity
B = Saturated aquifer thickness (saturated thickness of screen in single-well test of Well 1-C-1

*K = Hydraulic conductivity

*S = Storage coefficient (dimensionless)

control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.1.4 and in Appendix A.

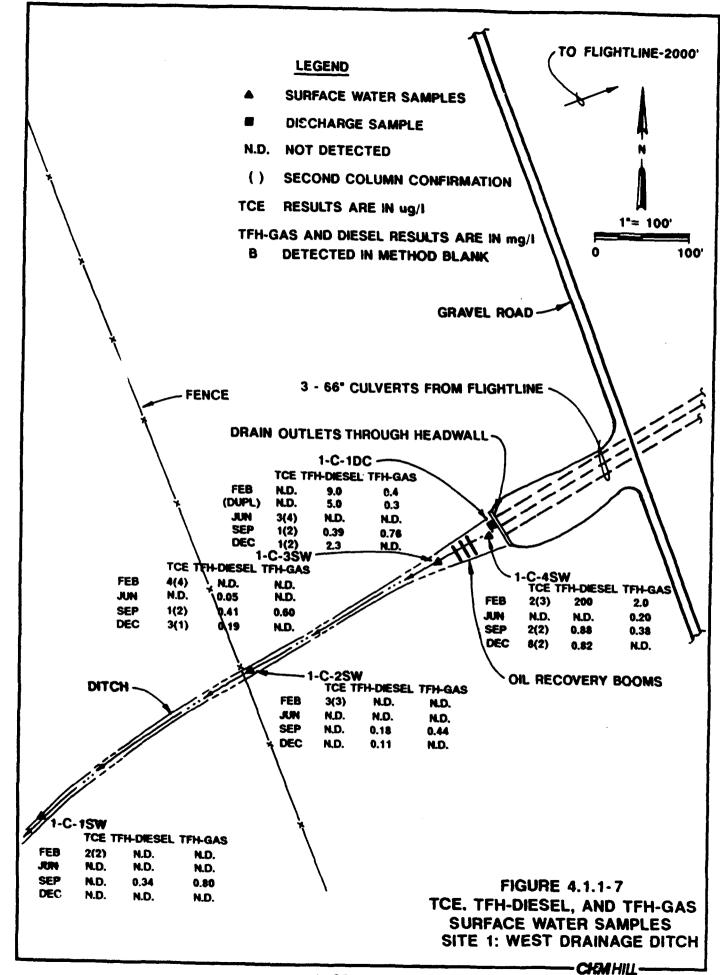
Surface Water

During the Phase II, Stage 1 study (AeroVironment, 1987), TCE was detected in one surface water sample. Oil and grease were detected in all surface water samples collected.

In the Stage 2-1 water sampling at Site 1, four surface water samples (1-C-1SW to -4SW) and one pipe discharge sample (1-C-1DC) have been collected in each round. Analyses performed for water samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), lead (7421), water quality parameters (various methods), and total fuel hydrocarbons (TFH)-diesel and -gas (California method). A complete list of analytes for each analysis is given in Appendix A.

During the first round, water discharging to the West Drainage Ditch from the northernmost of three culverts did not contain trichloroethene (TCE) in the single discharge sample, but all surface water sampled within the ditch did contain TCE at concentrations ranging from 2 to 4 ug/l. TFH-diesel and TFH-gas were detected in the discharge sample (9.0 mg/l and 0.4 mg/l, respectively) and in surface water sample 1-C-4SW (200 mg/l and 2 mg/l, respectively). Samples taken downstream of 1-C-4SW had no detected TFH-diesel or -gas. Toluene was not detected in first round surface water samples. Figure 4.1.1-7 shows the concentrations of TCE and TFH in each round of surface water samples.

Surface water sampled during the first round, including discharge to the ditch, had general water quality parameters of specific conductivity, alkalinity, major anions and cations, and total dissolved solids, all at lower values than the groundwater samples. All surface water and groundwater samples were filtered in the field through 0.45-micron filters prior to being preserved and sent to the lab for analysis for dissolved constituents. Sample results have been compared to the applicable standard. Iron and manganese were detected in surface water but not in groundwater samples. Iron was detected in the two farthest downstream surface water samples (1-C-1SW and -2SW) at 0.109 and 0.107 mg/l, just above the 0.100 LOQ and below the 0.3 mg/l national



secondary drinking water standard. Manganese was detected in all samples ranging from 0.034 to 0.063 mg/l, compared to the national secondary drinking water standard of 0.050 mg/l.

In the second round surface water samples, TCE was detected at 3 ug/1 (4 ug/1 in the second column) in the discharge sample but was not detected in downstream surface water samples (Figure 4.1.1-7). Toluene was not detected in surface TFH-diesel was not detected in the discharge water samples. sample and was only detected downstream in 1-C-3SW at 0.050 mg/l. TFH-gas was not detected in the discharge sample and was only detected downstream in 1-C-4SW at 0.20 mg/l. In addition to iron, which ranged from not detected to 0.188m g/l, and manganese, which increased, ranging from 0.034 to 0.227 mg/l, barium was detected in the second round surface water samples at from 0.129 to 0.163 mg/l below the national primary drinking water standard of 1.0 mg/1. Zinc ranged from not detected to 0.042 mg/l, below the secondary drinking water standard at 5.0 mg/1.

In the third round samples, TCE was detected at 1 ug/1 (2 ug/1 in second column) in the discharge sample 1-C-1DC (collected from the northernmost culvert), 2 ug/1 (2 ug/1 in second column) in 1-C-4SW, the nearest downstream sample, 1 ug/1 (2 ug/1 in second column) in 1-C-3SW, the next downstream sample, and TCE was not detected in other downstream samples (Figure 4.1.1-7). Toluene was 1 ug/l in 1-C-1DC, but not detected in the second column. TFH-diesel was detected at 0.39 mg/l in the discharge sample, 0.88 mg/l in downstream sample 1-C-4SW, 0.41 mg/1 in 1-C-3SW, 0.18 mg/1 in 1-C-2SW, and 0.34 mg/1 in 1-C-1SW. TFH-gas was detected at 0.76 mg/l in the discharge sample, 0.38 mg/l in 1-C-4SW, 0.60 mg/1 in 1-C-3SW, 0.44 mg/1 in 1-C-2SW, and 0.80 mg/1in 1-C-1SW. Iron was detected only in 1-C-2SW at the 0.100 mg/1 LOQ. Manganese ranged from 0.198 in the discharge sample rising downstream to 0.741 mg/l in 1-C-1SW. Barium was not detected in the discharge sample but ranged from 0.144 to 0.146 mg/l in the downstream samples. Zinc ranged from 0.031 to 0.059 mg/1.

In the fourth round surface water samples, TCE was detected at 1 ug/1 (2 ug/1 in the second column) in the discharge sample 1-C-1DC, 8 ug/1 (2 ug/1 in the second column) in 1-C-4SW, the nearest downstream sample, and 3 ug/1 (1 ug/1 in the second column) in 1-C-3SW, the next downstream sample. TCE was not detected in other downstream samples (Figure 4.1.1-7). Toluene was 1 ug/1 (9 ug/1 in the second column) in 1-C-1DC, 1 ug/1 (8 ug/1 in the second column) in 1-C-4SW, not detected in 1-C-3SW, 1 ug/1 (1 ug/1 in the second column) in 1-C-2SW and not detected in 1-C-1SW.

TFH-gas was not detected in any surface water samples. TFH-diesel was detected at 2.3 mg/l in discharge sample 1-C-1DC, 0.82 mg/l in 1-C-4SW, 0.19 mg/l in 1-C-3SW, 0.11 in 1-C-2SW and not detected in 1-C-1SW, the farthest downstream sample. Manganese was detected at 0.0468 mg/l in 1-C-1DC and 0.0472 mg/l in 1-C-4SW, 0.0394 mg/l in 1-C-3SW, 0.132 mg/l in 1-C-2SW, and 0.106 mg/l in 1-C-1SW. Iron was only detected in the two downstream samples at 0.159 mg/l in 1-C-2SW and 0.105 mg/l in 1-C-1SW. Barium ranged from 0.102 to 0.105 mg/l in all five surface water samples. Zinc ranged from 0.0227 to 0.0481 mg/l in all five samples.

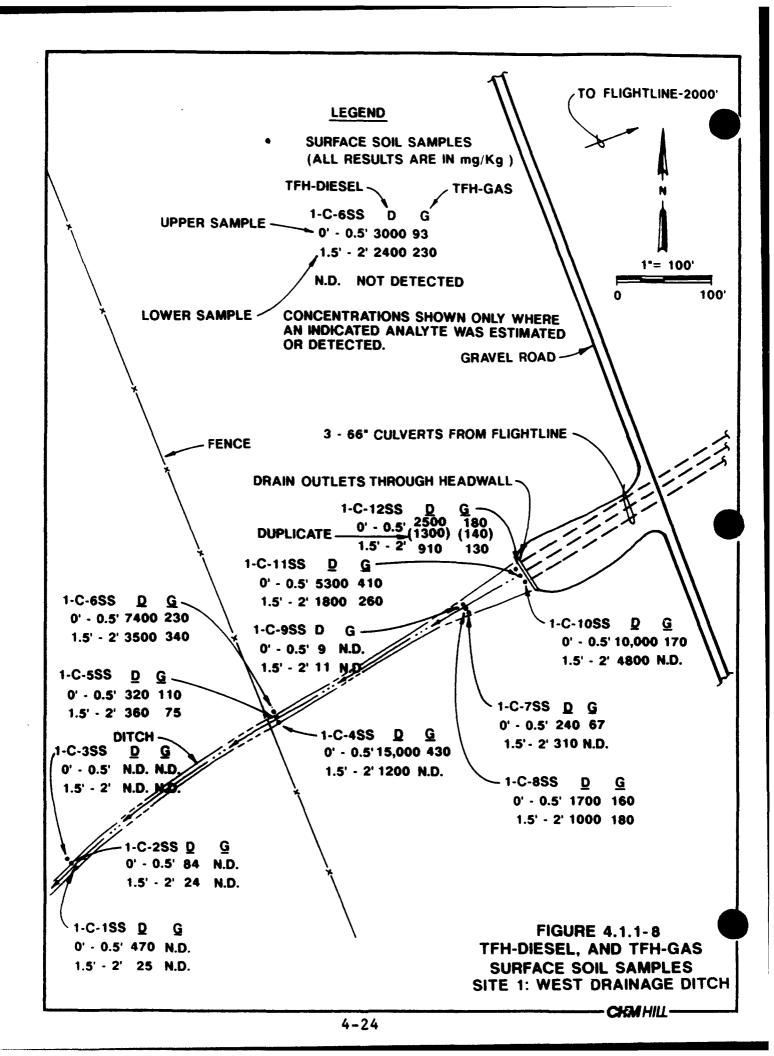
Sediment

A total of 24 stream sediment samples were collected at Site 1. These samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), soil moisture (ASTM D2216), and TFH-gas and diesel (California method).

All but 2 of the 24 stream sediment samples from the West Drainage Ditch had detected TFH-diesel as illustrated in Figure 4.1.1-8. Concentrations ranged from 9 to 15,000 mg/kg. In all cases the diesel fuel components were detected in the upper and the lower samples at each location. Thirteen of the 24 samples had detected TFH-gas. Concentrations ranged from 75 to 430 mg/kg. Five locations had TFH-gas in both the upper and lower sample, while three of the samples with detected TFH-gas were from an upper sample, with no TFH-gas detection in the lower sample. Toluene was detected in six sediment samples at concentrations above the LOQ and four samples at estimated values below the LOQ, but are not shown on Figure 4.1.1-8.

Semivolatile compounds were also detected in stream sediment samples. Bis(2-ethylhexyl) phthalate was detected in six samples at concentrations of 1.2 to 14 mg/kg. This compound was detected in both upper and lower samples. The origin of the phthalate is uncertain; it may represent a false positive. Seven compounds (phenanthrene, fluoranthene, pyrene, benzo(a) anthracene, chrysene, benzo(b) fluoranthene, and benzo(a) pyrene) were detected in the zero to 0.5-foot sample at 1-C-8SS at concentrations less than 12 mg/kg but above the LOQ of 2.3 mg/kg.

Metals were detected in surface sediment samples at levels similar to soil samples collected at other sites on base. Lead, only found in one background soil sample on base, was detected in 18 of the surface sediment samples at concentrations from 29.3 to 269 mg/kg. Cadmium, chromium, and zinc were also detected at levels greater than two standard deviations above the averaged mean values from background



soil borings at other IRP sites on base. Cadmium was not detected in background soil borings. Background values for stream sediments were not taken. There may be a difference in the background values of stream sediment versus material found in background borings. However, the background soil boring values were only a basis of comparison.

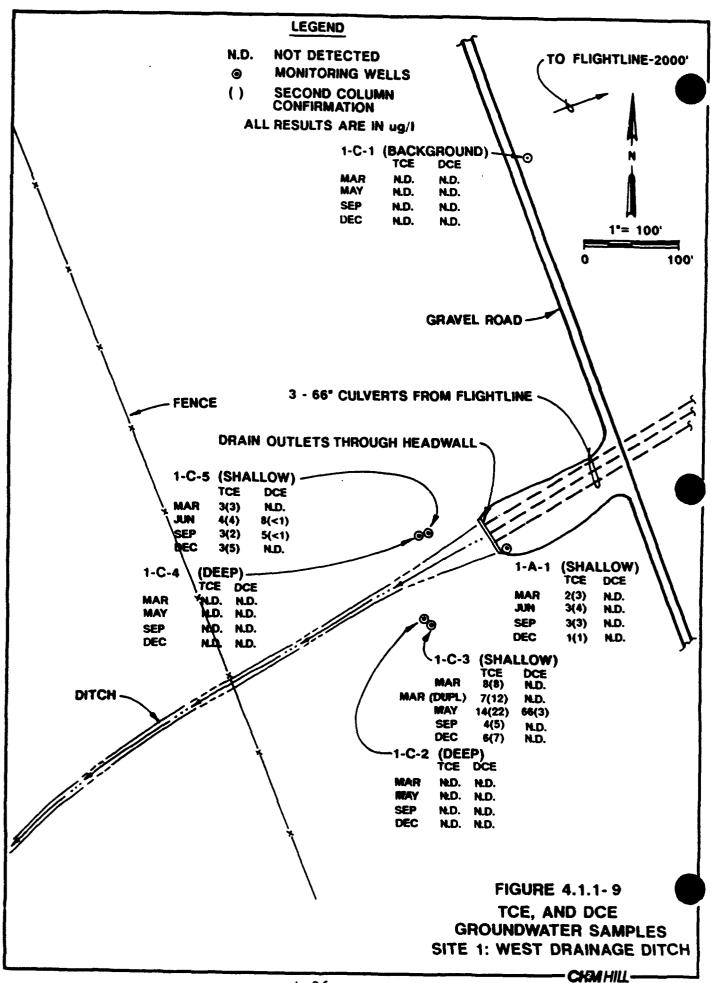
Groundwater

Volatile organic compounds were detected in well 1-A-1 during Phase II, Stage 1 studies. TCE was detected at 100~ug/1 and 58~ug/1 in two sampling rounds.

Analyses performed for groundwater samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), lead (7421), water quality parameters (various methods), and TFH-gas and -diesel (California method).

Groundwater at Site 1 contained TCE in first round samples from 1-C-3, 1-C-5, and 1-A-1 at concentrations ranging from 2 to 8 ug/1, and in a field replicate sample from 1-C-3 at 7 ug/1 (see Figure 4.1.1-9). Second column confirmation data for 8010 and 8020 analyses are consistent with first column results. These wells are all screened across the water table (shallow wells), relative to wells 1-C-2 and 1-C-4, which are screened below the water table (deep wells). TCE was not detected in the deep wells or the background well at Site 1.

For all the wells at Site 1, general water quality parameters such as specific conductivity, total dissolved solids, alkalinity, and pH were similar and did not indicate the presence of contamination. Common cations and anions occurred in similar amounts to those in analyses from base water supply wells in the 1960s and 1970s (Page, 1980) except for the 23.4 mg/l of sulfate in 1-C-3, higher than the maximum of 8.1 mg/l in base water supply wells or 10.2 mg/l in well 1-A-1. However, sulfate dropped to 14.7 mg/1 in the second, 8.0 mg/l in the third, and 7.3 in the fourth sampling rounds as noted below. TDS ranged from 185 to 250 mg/l in the first round and from 232 to 324 mg/l in later rounds. Water type varies from sodium bicarbonate to sodium-calcium bicarbonate. Silica was not analyzed for in this investigation but ranged from 40 to 66 mg/l in base water supply wells located about 8,000 feet west of Site 1 (Page, 1980). values typically exceed the sum of the measured anions and cations. The lack of a silica analysis may account for most of this difference at Site 1 and throughout the base.



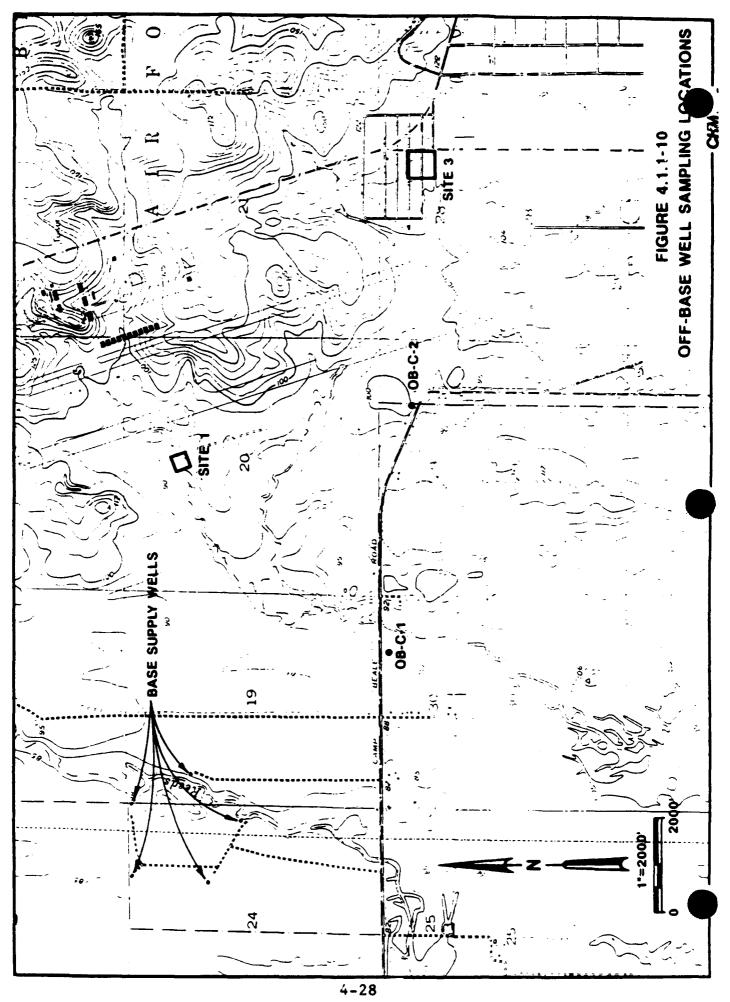
Other than the common water quality parameter cations (calcium, potassium, magnesium, and sodium), the only metal detected in the groundwater was zinc at wells 1-C-2, -3, and -4 which ranged from 0.047 to 0.285 mg/l compared to the national secondary drinking water standard of 5.0 mg/l.

Second round groundwater samples (Figure 4.1.1-9) had TCE at 3 ug/1 in 1-A-1 (4 ug/1 in the second column), 4 ug/1 in 1-C-5 (4 ug/l in the second column) and 14 ug/l in 1-C-3(22 ug/1 in the second column). Trans-1,2-DCE was detected in 1-C-3 at 66 ug/1 but only 3 ug/1 in the second column confirmation. Laboratory review of the 8010 analysis for 1-C-3 indicated that the reported trans-1,2-DCE was probably cis-1,2-DCE, which is not on the 8010 analyte list. Trans-1.2-DCE was detected in 1-C-5 at 8 ug/1 but was not detected in the second column confirmation. Toluene was either not detected or detected at 1 or 2 ug/1 and not confirmed in the second column confirmation. No organic chemicals were detected in background well 1-C-1 or deep wells 1-C-2 and 1-C-4. Water quality parameters did not change significantly apart from sulfate in well 1-C-3 dropping to 14.7 mg/l. Zinc was detected only in well 1-C-3 at 0.033 mg/l and in 1-A-1 at 0.028 mg/l.

Third round groundwater samples (Figure 4.1.1-9) had TCE at 3 ug/l in well 1-A-1 (3 ug/l in second column), 3 ug/l in 1-C-5 (2 ug/l in second column) and 4 ug/l in 1-C-3 (5 ug/l in second column). Trans-1,2-DCE was detected in 1-C-5 at 5 ug/l but was not detected in the second column confirmation. Toluene was either not detected or detected at 2 to 3 ug/l and not confirmed in the second column confirmation. No organic chemicals other than toluene were detected in background well 1-C-1 or deep wells 1-C-2 and 1-C-4.

Two off-base private water supply wells were sampled for 8010 analyses during the third quarterly sampling round (Figure 4.1.1-10). The first well (OB-C-1) is located by a house on the south side of North Beale Road about 1 mile west of the main gate for Beale AFB. It was sampled from a tap outside the house. No organic chemicals were detected. The second well (OB-C-2) is located by a house on the north side of North Beale Road about 100 yards west of the main gate. It was sampled from a faucet east of the garage, and no organic chemicals were detected.

Water quality parameters did not change significantly apart from sulfate, which dropped again in 1-C-3 to 8.0 mg/l as in other wells at Site 1. Zinc was not detected in any



monitoring well. Manganese was detected again in 1-C-3 at 0.018~mg/l. Nickel, which had not been detected previously, was detected at 0.060~mg/l. Iron was detected in 1-A-1 at 0.392~mg/l.

Fourth-quarter groundwater samples (Figure 4.1.1-9) had TCE at 1 ug/1 in well 1-A-1 (1 ug/1 in the second column), 3 ug/1 in 1-C-5 (5 ug/1 in the second column), and 6 ug/1 in 1-C-3 (7 ug/1 in the second column). Toluene was only detected in deep well 1-C-4 at 3 ug/1 (4 ug/1 in the second column). TFH-diesel was detected in well 1-A-1 at 0.10 mg/1 and in well 1-C-2 at 0.06 mg/1.

The two off-base private water supply wells were sampled again for 8010 analysis during the 4th quarter. TCE was detected in the first column at 1 ug/1 but was not confirmed in the second column for OB-C-1. No analytes were detected at OB-C-2.

Water quality parameters did not change significantly in the fourth quarter. Sulfate at 1-C-3 was 7.3 mg/l, similar to the 8.0 mg/l detected in the third round sample. Nickel was detected at 0.0575 mg/l in 1-C-3. Zinc and manganese were only detected at 1-A-1 at 0.0291 mg/l and 0.142 mg/l, respectively. Chromium was detected at 0.0311 mg/l, lead at 0.0089 mg/l, and iron at 6.88 mg/l in 1-A-1.

4.1.1.1.4 Analytical Results Table

Table 4.1.1-3 presents a summary of all detected analytes for Site 1 and the two nearby off base domestic wells sampled in September and December 1989. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.1-3 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of Applicable or Relevant and Appropriate Requirements (ARARs) is given in Appendix I.

4.1.1.1.5 Discussion of Analytical Data

Contaminants were detected at Site 1 in all media sampled. Table 4.1.1-4 summarizes the range of contaminants encountered for each media sampled (surface water, sediments, and groundwater), as well as the number of positive detections compared to the number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

TABLE 4.1.1-3

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 1

				Standards,	Criteria	1-C-15S	1-C-1SS	1-C-2SS	1-C-2SS	1-C-388	1-C-3SS	
				and Action	Levels (a)	BAFB-0127	BAFB-0128	BAFB-0129	BAFB-0130	BAFB-0131	BAFB-0132	
		Detection				0.0-0.5	1.5-2.0	0.0-0.5	1.5-2.0	0.0-0.5	1.5-2.0	
Parameter	Method	Limit	Units	Federal	State	11/30/88	11/30/88	11/30/88	11/30/88	11/30/68	11/30/88	
Percent Moisture	ASAMO	4/H	×	SE	SH	21.3	16.1	18.7	17.2	15.1	13.1	
TF#-Diesel	TFN-DI	1.0	ao/ko	SE	SH	27	X	ž	*	9	2	
Aluminum	Su6010	20.0	2 0/kg	SE	SH	7000	5110	2360	8450	10900	7180	
2 in	Su6010	10.0	me/ko	SE	10,000	121	<u>\$</u>	6 2	116	151	193	
Cadaius	Su6010	0.0	Mo/ko	SE	9	1.3	윺	2	9	2	욮	
Calcium	S 46010	5	e/ka	SE	SH	1650	1530	1720	2910	2400	1930	
Chromium	Su6 010	3.0	Z/ko	SE	200	46.5	22.6	29.0	32.2	31.3	28.7	
Cobelt	S46010	6.0	mo/kg	SN	8,000	11.6	19.1	12.3	12.1	10.0	11.5	
Copper	Sta6010	3.0	Mo/kg	SN N	2,500	20.3	11.4	110	13.3	14.1	12.7	
5	Su6010	10.0	mo/ks	SE	SH	14500	10900	13400	16500	17100	15500	
Lead	SW6010	% %	Mo/kg	SE	1,000	59.1	9	9	₽	2	2	
Meanesium	Su6010	5	mo/kg	SH	SH	1310	1300	1550	2080	2200	1960	
Menanese	Su6010	5.	Mo/kg	SE	S	550	862	713	104	675	571	
Mickel	S46010	4.0	me/kg	SE	2,000	10.0	10.5	10.6	14.5	14.1	10.6	
Potassium	Su6010	9 2	Me/kg	SE	SE	082	욮	972	2	283	322	
Sodium	SW6010	5	Me/kg	SE	SE	151	፳	204	274	528	231	
Venedium	SW6010	o. 4	MG/KG	S	2,400	52.4	42.3	43.2	44.0	41.7	45.3	
2 inc	SW6010	2.0	MQ/kg	SH	2,000	58.8	16.7	1001	1 22.9	25.0	3 18.4 8	
Methylene Chloride	SW6240	0.00	MQ/kg	SE	SH	1.4	1.3	9.0	1 0.92 B	0.82	3 0.76 B	
Carbon Disulfide	SMB240	0.00	MO/kg	SE	SH	0.74	1 0.55 L	13 0.52	L 0.53	197.0	9	
Toluene	SMB240	0.005	MO/kg	SE	SE	2	윺	2	0.45	9	윷	
Phenot	SMB270	0.33	10 /kg	SH	SE		2.1	2.7 (1 2.4	1.6.1	1.88	
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1										********	

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) MS: No standard criteria or action level currently exists. ND: analyte not detected. NT: analyte not tested

NOTES: Results reported for detected analytes only.

(): values listed in () are 2nd column confirmation values.

e: equipment wash blank f: field replicate R: resample

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.1-3 (continued)

				Standards, Criteria and Action Levels (a	_	1-C-4SS BAFB-0133 BA	1-C-4SS IAFB-0134 BA	1-C-5SS AFB-0135	1-C-5SS BAFB-0136	1-C-6SS BAFB-0137	1-C-6SS BAFB-0138
Parameter	Method	Detection Limit	Units	Federal	State 12/0			0.0-0.5 ¹ 12/01/88	1.5-2.0	0.0-0.5 ¹ 12/01/88	1.5-2.0 ¹ 12/01/86
Percent Moisture	ASAMO	V/N	×	SN		35.2	27.6	15	16.5	59.2	32.3
TFH-Diesel	TFH-DI	1.0	Mo/kg	S		2000	1200	320	360	2400	3500
TFH-Gas	TFH-GA	8	Mo/kg	SZ		0£ 7	2	110	ĸ	230	%
Atuminum	Stu6 010	20.0	mo/kg	SE		3100	9990	3610	5720	17500	11100
Berica	S 46010	10.0	MQ/kg	ot sw	_	<u>3</u>	351	521	72.8	191	42
Cadaium	State 010	1.0	20/kg	SR	_	3.5	ş	욯	9	7.7	2.8
Calcium	Sw6 010	5	mo/kg	SE		0994	2240	1290	1650	0607	2270
Chromium	SW6010	3.0	Mo/kg	SE	200	102	55.7	34.6	27.1	61.5	45.1
Cobelt	Sw6010	4.0	Mo/kg	WS SM	_	12.5	49.5	10.4	6.5	13.5	10.2
Copper	SW6010	3.0	MO/kg	KS S	_	53.5	28.5	12.9	13.2	57.6	56.6
- 52	SW6 010	10.0	Mo/kg	SE		0001	17400	0986	10800	23900	15100
Lead	Sta6010	20.0	2 /kg	NS	_	242	123	엹	569	154	63.8
Magnesium	Stu6010	5	1 0/kg	SE		2530	1800	978	1530	2920	1540
Manganese	Stat6010	1.5	MO/kg	Ş		%	2600	265	183	645	533
Nickel	SW6010	4.0	MQ/kg	MS 2	_	24.7	¥.3	9.6	10.9	7.62	14.8
Potassium	SW6010	200	mo/kg	SE		20	387	235	311	92	340
Sodium	SW6010	5	Mo/kg	SX		7 92	75	호	143	324	176
Venedium	Suco10	4.0	MO/kg	NS 2	_	7.89	67.0	34.8	34.0	9.89	6.74
Zinc	Stu6010	2.0	MO/kg	SH SH	_	308	107	36.1	56.4	380	183
Hethylene Chloride	SM8240	0.00	MO/kg	SH		3.0%6 B	0.024 B	0.050 8	0.032	9 0.041	0.32 8
Toluene	SHB240	0.005	** 0/kg	SE	SH	.022	0.008	윺	2	0.044	97.0
Phenol	SHB270	0.33	mg/kg	SZ	SE	3.58	3.08	1.08	1.0.1	1.6.1	1.18
Isophorone	SMB270	0.33	mg/kg	SH	SE	웊	2	욡	9	2	0.53 J
2,6-Dinitrotoluene	SW8270	0.33	mo/kg	SE	SE	1.9	욮	윺	2	9	욮
Fluoranthene	SW6270	0.33	MO/kg	SE	SE	1.7.1	£	웆	윤	2	유
Pyrene	SW8270	0.33	mo/kg	S	SZ	8.2	윺	욮	웆	9	욡
Benzo(a)anthracene	SHB270	0.33	mg/kg	SE	S	1.2.1	ş	2	윤	욮	9
bis(2-ethylhexyl)phthalate	SW6270	0.33	MQ/kg	SH	SE	4	2.1	윺	윤	3.4	1.2
Chrysene	SHB270	0.33	10 /kg	S	S	2.3	₽	2	웆	身	2
Senzo(b)f(uoranthene	SW8270	0.33	mg/kg	SE	S	2.3	욡	윺	윺	2	욯
Benzo(k)fluoranthene	SW8270	0.33	2 0/kg	S	S	2.9	윺	윺	윤	2	욡
Benzo(a)pyrene	S46270	0.33	m 0/kg	SE	SI	1.0	9	욮	2	윺	욮

NOTES: Results reported for detected analytes only.

NT: analyte not tested ND: analyte not detected. NS: No standard criteria or action level currently exists.

8: snalyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

e: equipment wash blank f: field replicate R: resample

				Standards.	Criteria	1-C-7SS	1-c-7ss ⁶	1-c-7ss	1-C-8SS	1-C-8SS	1-c-988
				and Action	Levels (a)	BAFB-0190	BAFB-0191	BAFB-0192	BAFB-0193	BAFB-0194	8AFB-0195
		Detection				0.0-0.5	0.0-0.5	1.5-2.0	0.0-0.5	1.5-2.0	0.0-0.5
Parameter	Method	Limit	Units	Federal	State	12/08/88	12/08/88	12/08/88	12/08/88	12/08/88	12/08/88
Percent Moisture	ASA#9	¥/¥	×	SH	SE	25.3	24.2	2	25.3	21.6	13.3
TFH-Dieset	TFH-DI	1.0	mg/kg	SH	SH	240	220	310	1700	1000	9.5
TFH-Gas	TFH-GA	S	mg/kg	S	SN	29	38	윺	3	3	욮
Atuminum	S 46010	20.0	mg/kg	SI	S	7860	11000	9590	10800	9580	9030
Berium	Su6 010	10.0	mg/kg	SH	10,000	150	<u>\$</u>	2	592	18 0	141
Celcium	Stu6010	<u>5</u>	mg/kg	SR	SH	2160	2570	2350	3290	3270	2250
Chromium	Stu6010	3.0	mg/kg	SM	200	60.2	132	32.8	57.3	43.2	28.7
Cobalt	SW6010	0.4	mg/kg	SE	8,000	9.5	10.2	11.6	1.1	12.8	10.1
Copper	Stu6010	3.0	mo/kg	SE	2,500	22.8	18.5	18.8	26.8	19.1	16.1
I s	Sw6010	10.0	mg/kg	SE	SH	17900	18900	16600	18900	17300	17300
read	SW6010	20.0	mo/kg	SI	1,000	159	549	29.3	39.9	71.0	2
Magnesium	S46010	5	mo/kg	SZ	SI	1700	2040	1940	2500	2170	2080
Manganese	Stu6010	1.5	mo/kg	SH	SN	324	317	350	303	603	381
Nickel	SW6010	0.4	mg/kg	SI	2,000	16.1	18.5	16.3	21.4	7.02	16.1
Potassium	Stu6010	8	mo/kg	SN	SE	388	515	574	295	167	967
Sodice	SIJ6010	5	mo/kg	SH	SE	161	193	200	185	189	138
Vanadium	SW6010	0.4	mo/ka	SE	2,400	59.5	9.67	45.4	58.4	51.8	7.67
2 inc	010978	2.0	mo/ka	S	2,000	7.75	100	50.5	141	93.1	87.
Methylene Chloride	SUB240	0.005	/kg	S	S	0.025	0.034	B 0.018	8 0.017 1		BJ 0.021 B
Acetone	S-8240	0.010	ø/ka	S	S	0.019	0.025	2	2		,
Carbon Disulfide	SIMB240	0.005	mo/ko	SZ	S	9	2	2	2	0.018	9
1.2-Dichloroethene (total)	SUB240	0.00	mo/kg	S	S	9	9	2	2	0.011	2
Trichtoroethene	SMB240	0.00	mo/kg	SE	2,040	0.00	0.003	0.003	2	0.013	2
Tetrachloroethene	Su6240	0.002	mo/kg	SH	SE	2	욮	2	2	0.015	2
Toluene	SW8240	0.002	mg/kg	SE	SE	2	욮	2	0.007	0.023	9
Ethylbenzene	SW8240	0.00	mg/kg	SN	SH	9	€	2	2	0.013	9
Xylenes (total)	SNB240	0.005	mg/kg	SE	SH	윺	윺	욡	2	0.022	윺
Phenol	SW6270	0.33	mg/kg	S#	SH	0.62	BJ 1.6	8 1.6	1.9.	1.0.1	3. 1.2 8
N-nitrosodiphenylamine	SW6270	0.33	mg/kg	SH	SE	윺	2	윺	윷	Q	0.096
Phenanthrena	Su 6 270	0.33	mg/kg	SI	S	0.37	율	0.28	1 4.3	욡	윺
Anthracene	Sub270	0.33	mg/kg	S	S	2	₽	욮	0.52	_	_
Fluoranthene	Sub270	0.33	mg/kg	S	S	R	₽	9	12		2
Pyrene	SM8270	0.33	mg/kg	S	S	ફ	₽	皇	9.5	0.47	유
Benzo(a)anthracene	SIMB270	0.33	mg/kg	S	S		皇	皇	4.3	2	윺
bis(2-ethylhexyl)phthalate	SIMB270	0.33	mg/kg	SZ	SZ	0.36	8	2	2.7	0.91	87 78
Chrysene	SW8270	0.33	mg/kg	SZ	SE	윺	윺	2	7.9	2	윺
Benzo(b)fluoranthene	SW8270	0.33	mg/kg	SE	SH	2	2	9	6.3	9	윺
Benzo(a)pyrene	SW8270		mg/kg	S#	SE	웆	웆	9	3.9	2	울
Indeno(1,2,3-cd)pyrene	SNB270	0.33	mg/kg	SI	N.	9	웆	Q	0.62	윤 유	윺
			2						,		
MOIES: Mebulis reported for Detected analytes	oetected			å	analyse date	to It of betacted to It out	Ļ			tentiment took the	400
				-	manyle dete	Life on Dia	**************************************	tini l	1019	Americ Masis	
MD: Maryle Not detected.			444		estimated value,	Total Care	Delow quantification timit		ווי וופונ	ried repricate	
MS: No standard criteria of action level C	action le	vel current	urrently exists oficmetion valu	0	Tield Diank	tield blank (ambient condition blank)	אלוונוסה בומומי	S.	K: resembl	ole.	

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. (): values listed in () are 2nd column confirmation values.
 a: Values represent most atringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Nitrate.

1ABLE 4.1.1-3 (continued)

				and Action I	Levels (a)	BAFB-0196	BAFB-0197	BAFB-0198	BAFB-0199	BAFB-0200	BAFB-0201
Parameter	Method	Detection Limit	Units	Federal	State	1.5-2.0° 12/08/88	0.0-0.5 12/08/88	1.5-2.0	12/08/88	1.5-2.0	0.0-0.5 12/08/88
Percent Moieture	ASAMO	N/A	×	SZ	SR	14.3	41.6	39.9	43.3	38.7	23.8
TFK-Diesel	TFN-D1	1.0	mo/kg	SE	SI	=	10000	7,800	5300	1800	2200
15H-GBB	75-5	S	20/kg	SH	SZ	9	5	⊋	410	5 092	38 1
Atumina	S146010	20.0	mo/kg	SE	SH	10400	13200	16000	13100	24800	11400
Berice	Stu6010	10.0	mg/kg	SZ	10,000	52	165	193	222	587	200
Cadaius	Stu6010	1.0	MQ/kg	SH	100	2	윺	2	1.8	물	윭
Calcium	Stu6010	5	MQ/kg	SH	S#	2150	4370	4810	4390	4710	3190
Chromium	SW6010	3.0	MO/kg	SR	200	37.2	72.1	70.7	63.0	46.5	6.69
Cobelt	S46010	0.4	MQ/kg	S#	8,000	11.7	11.1	16.1	19.4	17.9	12.1
Copper	S46010	3.0	10 /kg	SH	2,500	17.5	4 .2	45.9	7.67	38.3	26.5
181	S46010	10.0	MQ/kg	SE	E	18700	19300	23800	24300	31600	20700
pear	SU6010	20.0	mo/kg	SN	1,000	¥	119	8.06	8 4.1	34.9	87.0
Megnesium	Su6010	9	mo/kg	SH	HS	1910	3540	2800	3100	3650	2390
Managnese	SW6010	1.5	MO/KG	SE	SH	250	250	867	610	481	58 2
Rickel	Su6010	0.4	MQ/kg	SE	2,000	19.8	32.5	25.0	30.0	33.1	19.7
Potassium	Su6010	200	mg/kg	SH	S#	225	35	832	216	26	8
Sodium	Su6010	5	mo/kg	NS.	SH	5	787	282	5 99	382	5 91
Vanedium	Su6010	4.0	MQ/kg	SH	2,400	58.2	58.7	9.89	72.1	76.3	63.4
Zinc	Su6010	2.0	mg/kg	SH	2,000	31.4	248	145	277	127	8.5
Methylene Chloride	Sub240		MG/K9	SW	S#	0.032	0.075	8 0.078	8 0.076	B 0.028	BJ 0.017 B
Acetone	SW6240	0.010	mg/kg	SH	S#	2	2	0.12	9	0.026	8. 0.17 B
Trichloroethene	SW8240		36/kg	SH	2,040	2	2	2	皇	2	7 600.0
Toluane	Su6240	0.005	mo/kg	SH	SH	2	0.015	₽ -	0.19	0.060	2
Phenol	SU6270	0.33	10 /k0	Ş	SE	96.0	2	1.4.	9.1.6	8.1 1.8	1.3
2,4-Dinitrotoluene	S46270	0.33	mg/ kg	SE	S	2	2	윺	2	웆	0.13
N-nitrosodiphenylemine	Su6270	0.33	2 /kg	SZ	S	욮	욮	2	윺	2	0.13 J
Phenenthrene	SU6270	0.33	mo/kg	SE	S	2	呈	0.14	2	0.13	2
Di-n-butylphthalate	SUB270	0.33	Mg/kg	SE	SE	2	2	2	0.63	28	0.10
Fluoranthane	SM6270	0.33	MQ/kg	S	S	2	1.0	皇	0.74	BJ 0.29	2
Pyrene	SUB270	0.33	MQ/kg	SE	SH	2	1.3	2	0.72	J 0.31	2
Butyl benzyl phthal ate	SU6270	0.33	20/kg	SE	SE	2	2	呈	0.58	9	윺
Benzo(a)anthracene	SU6270	0.33	mg/ kg	S#	SI	2	0.87	9	0.62	J 0.18	2
bis(2-ethylhexyl)phthalate	SUB270	0.33	20/kg	SE	S	9	5.1		B 2.1	BJ 1.1	8. 0.25 B
Chrysene	SU6270	0.33	mg/kg	SE	SH	2	1.3	1 0.14	٥9.0 ٢	J 0.20	울
Benzo(a)pyrene	SN8270	0.33	mg/ kg	SE	S	2	0.62	유 구	2	읖	2

MOTES: Results reported for detected analytes only.

e: equipment wash blank f: field replicate R: resample

MI: analyte not tested

MD: analyte not detected.

MD: astimated value, below quantification limit.

MD: down standard criteria or action level. See Appendix I.

The federal atandard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Parameter		•		and Action Levels (a	Levels (a)	BAFB-0202	BAFB-0205
	Method	Detection Limit	Units	Federal	State	12/08/88	12/08/88
_	ASABO	V/N	×	S#	SE	30.5	32.9
TER-Dises!	TFM-DI	1,0	mo/ko	SE	SN	1300	910
•	TFH-GA	2	mo/ko	SE	SH	140	130
-	01097	20.0	Ma/kg	SE	SN	9810	13100
	516010	10.0	mo/ko	SE	10,000	38	380
•	546010	00	mo/ko	S¥	SE	2630	3220
	S46010	3.0	Z/ko	S	200	0.04	35.3
•	Sucoto	0.4	mo/ko	S	8,000	11.7	16.4
•	510010	3,0	mo/ko	S	2,500	21.6	25.3
	20070	0.01	es/ka	SE	SZ	18700	21600
-	Sucoto	200	mo/kg	SE SE	SZ	2200	2490
-	Su6010	1.5	20/kg	SE	SZ	%	804
	Su6010	0.4	6/Ko	SE	2,000	17.3	25.3
-	SW6010	200	Ma/ko	S¥	SR	719	989
	SW6010	2	mo/kg	SH	SZ	549	277
	SW6010	0.4	Mo/kg	S¥	2,400	24.7	62.0
	Su6010	2.0	MQ/kg	S¥	2,000	13¢	103
-	S46240	0.005	#a/kg	S¥	SR	0.020 81	0.021 83
	S16240	0.005	Z/kg	SE	SZ	0.019	0.015 BJ
	SU6270	0.33	mo/ko	SE	SH	0.59 83	0.33 81
	02/2978	0.33	ø/ko	SE	S#	0.11	윺
	200		a/ko	S	S	0.19 8	0.22 BJ

WOTES: Results reported for detected analytes only.

Wit analyte not tested

Wit analyte not detected.

Wit analyte not detected in blank

Wit is analyte detected in blank

Wit analyte not detected analytes on action limits. Actual detection limits for each analysis are given in Appendix A.

Betection limits are for dilution = 1.0 and represent target detection limits.

TABLE 4.1.1-3

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 1

				and Action Lo	Levels (a)	1-C-164	1-C-26M	1-C-56E	見うう-ン	2	5
	Method	Detection Limit	Units	Federal	State	BAFB-0491 03/16/89	BAFB-0497 03/17/89	BAFB-0493 03/16/89	BAFB-0494 03/16/89	BAFB-0495 03/17/89	BAFB-0496 03/17/89
				77	6	145	225	239	239		=
COLC I VI TY	- ·	- 1	100/em	2 2	¥ #	10 s	200	19.5	19.5	19.0	=
Temperature	E120.1	< <u> </u>	2 2 3 4	S - 5	2 2	7.13	8.6	7.8	2.8	7.8	4
		€ -	į	΄ ξ	S	20.0	0.89	8.06	87.2	7.0	H
	35	-	Ì	S	S	85.4	83.0	110.8	106.4	8.5	Ħ
	3	· -	ì	200	200	185	<u>&</u>	549	250	율	
	- K		Ì	200	250	12.0	27.5	27.0	27.5	₽	=
	25	95.0	ì	^	1.4	0.21	0.16	0.25	0.22	₽	R
	77.5	5	Ì	' 5	45	7.1	4.3	4.3	5.1	2	H
	: K		Ì	, K	250	7.5	85.55	23.4	26.2	2	Ħ
		S S	Ì	S	S	9	2	9	Ş	0.10	T.M.
	5 5	8	Ì	<u> </u>	S	1.1	11.1	19.6	19.9	ş	Ħ
		8	Ì	S	SE	6.10	5.58	11.1	11.2	웆	H
		8	7	S	S	2.80	3.5	3.5	2.40	윺	Ħ
		8	Ì	S	S	17.5	28.5	26.2	27.2	2	Ħ
	5 5 5	0000	```	0,110	0.012	2	0.285	0.118	0.0950	윺	H
		}	7	.	•	2	2	8(12)	7(8)	₽	£
Tolund	070	-	3	14,300	5	101	8	₽	9	2	9

MOTES: Results reported for detected analytes only.

e: equipment wash blank f: field replicate R: resample

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. WIT smalyte not tested

WIT smalyte not tested

WIT smalyte not detected.

WIT small standard for Witnest + Witnite is given as 10 mg/l as Witnesten which is equal to the State of California Standard of 45 mg/l for Witnesten Witnite given as 10 mg/l as Witnesten which is equal to the State of California Standard of 45 mg/l for Witnesten Witnite given as 10 mg/l as Witnesten which is equal to the State of California Standard of 45 mg/l for Witnesten Witnite given as 10 mg/l as Witnesten which is equal to the State of California Standard of 45 mg/l for Witnesten Witnite given as 10 mg/l as Witnesten Witnite given as Witnesten Witnite given as 10 mg/l as Witnesten Witnite given as Witnesten Witnite given as Witnite given Witnesten Witnite given Ballow Witnesten Witnite given Witnesten Witnite Wi

TABLE 4.1.1-3 (continued)

				Standards, Cr and Action Le	riteria Ivela (a)	1-C-46W	1-C-5GW	1-A-1GW	1-0-100	1-C-1DC ⁽	1-C-10C
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0499 03/20/89	BAFB-0498 03/17/89	BAFB-0492 03/16/89	BAFB-0446 02/22/89	BAFB-0447 02/22/89	BAFB-0465 02/22/89
Specific Conductivity	E120.1	1.0	Unitos/cm	SZ	8	300	203	220	92		TA
Temperature	E170.1	K/M	de G	S	S	21.0	20.0	19.5	13.5	7 5	
ŦĞ.	£150.1	N/A	£	2-6	SR	7.30	7.76	7.20	7.08		8
Alkalinity - Total	SHK 03	1.0	7/0	ଛ	SE	71.6	76.8	81.6	22.4		2,4
Bicarbonate	\$14 03	1.0	7	SI	SE	87.4	93.7	8.	27.3		. 0
Total Dissolved Solids	E160.1	3.0	7	200	200	185	194	208	62.0		202
Chloride	E325.3	1.0	7/2	220	250	11.5	15.5	22.5	9		3
Fluoride	E340.2	0.050	2	~	1.4	0.28	0.54	0.25	9		9
Nitrate + Nitrite	£353.3	0.020	7	•	45	6.4	6.8	5.9	0		
Sul fate	E375.4	. 0)/ 2	220	250	5.7	8.0	10.2	F 7		3
TFH-Diesel	TFK-DI	0.020	/	S#	¥.	2	2	9	0		3
TFH-Gas	TFH-GA	0.10	1/0	SE	SE SE	9	9	S	07 0		}
Celcium	Stu6010	- .8	7	SE	SE	9.41	15.3	11.6	7.00		x 12
Magnes i un	Su6010	0	7	SE	SE	5.10	6.77	6.19	S		:
Manganese	Su6010	0.0150	7	સં	દ	2	2	2	0.0340		9
Potassium	Su6010	- 8.	7/0	SH	SN	1.60	1.60	5.	9		9
Sodium	Su6010	- 8.	ž	SH	SH	30.2	20.3	29.7	2.05		9
Zinc	Su6010	0.0200	7	0.110	0.012	0.0470	2	2	0.0360		£
Trichloroethene	S16010	-	7	'n	'n	2	3(3)	2(3)	9		9

MOTES: Results reported for detected analytes only.

MI: enalyte not tested

MI: enalyte not tested

MI: enalyte not tested

MI: enalyte not tested

MI: enalyte not detected.

MI: enalyte not detected.

MI: enalyte not detected.

MI: estimated value, below quantification limit field replicate

MI: estimated value, below quantification limit field replicate

MI: estimated value, below quantification limit field replicate

MI: estimated value, secondition blank)

R: resample

As mg/l as Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l

for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent mass and mission are given in Appendix A.

TABLE 4.1.1-3 (continued)

Parameter Method Limit Units Federal State 02/22/89 02/21/89					Standards, Candards, Candards	Criteria Levels (a)	1-c-10cb	1-C-15W	1-c-284		1-C-4SW	
conductivity E120.1 1.0 umhos/cm NS NS NY 130 132 15.5 15.5 15.5 15.5 15.5 15.5 15.5 15.	Parameter	Method	Detection Limit	_	Federal	State	BAFB-0466 02/22/89	BAFB-0442 02/21/89	BAFB-0443 02/21/89		BAFB-0445 02/21/89	
Fe E170.1 N/A deg C NS NS NY 14.5 15.5 19 18.00 18.70 18.50 18.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19	Specific Conductivity	£120.1	1.0	umpos/cm	SR	8	*	130	132	135	135	
E150.1 N/A pH 5-9 NS NT 6.90 6.76 7 8 6.4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	Temperature	£170.1	4/H	200	SI	SH		14.5	15.5	14.5	13.2	
re swk03 1.0 mg/l 20 NS NT 59.2 68.4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	7	E150.1	N/A	₹.	2-9	SE	Ħ	8.9	8.76	7.54	6.61	
te swk03 1.0 mg/l NS NS NT 72.2 83.4 7 10 loulved Solids E160.1 3.0 mg/l 500 500 NT 158 160 15.0 15.0 15.0 15.0 15.0 15.0 15.0 15.	Alkalinity - Total	S##603	1.0) 	50	SE	Ħ	59.5	4.89	63.6	70.0	
Mitrite E35.3 1.0 mg/l 250 250 NT 158 160 15.0	Bicarbonate	SH4 03	1.0	7	SH	SH	E	2.2	83.4	77.6	85.4	
E325.3 1.0 mg/l 250 250 NT 14.0 15.0 1 1	Total Dissolved Solids	E160.1	3.0	7	200	200	H	158	160	157	162	
Hitrite E340.2 0.050 mg/l 2 1.4 NT 0.12 0.11 0 0.15 0.050 mg/l 10° 45 NT 1.0 1.4 0.050 Mg/l 10° 45 NT 1.0 1.4 0.050 Mg/l 1.05 0.050 MT 6.8 6.3 0.050 Mg/l 0.5 0.5 0.5 NT 0.05	Chloride	£325.3	1.0	7	520	250	Ħ	14.0	15.0	14.0	14.9	
Witrite E353.3 0.050 mg/l 10* 45 NT 1.0 1.4 SM7421 1.0 mg/l .05 .05 NT 6.8 6.3 SM6010 1.00 mg/l .05 .05 NT 15.7 1 SM6010 0.100 mg/l .3 .3 NT 15.5 15.7 1 SM6010 1.00 mg/l .3 .3 NT 15.6 5.74 5 SM6010 1.00 mg/l .05 NT 0.630 0.0570 0.0 SM6010 1.00 mg/l NS NT 1.50 1.60 1 SM6010 1.00 mg/l NS NS NT 11.4 1 swb010 1.00 mg/l NS NS NT 11.4 1 swb010 1.00 mg/l NS NS NT 11.4 1 swb010 1.00 mg/l	Fluoride	E340.2	0.050	7	~	1.4	Ħ	0.12	0.11	0.11	0.12	
E375.4 1.0 mg/l 250 250 NT 6.8 6.3 0.0 NT 6.8 6.3 0.0 NT 6.8 8.3 0.0 NT 8.2 NT	Mitrate + Mitrite	E353.3	0.050	Ž	10	45	H	1.0	1.4	8.	2.1	
Suf721 0.0050 mg/l 0.05 NT ND ND 0.0 Su6010 1.00 mg/l NS NS NT 15.5 15.7 1 Su6010 0.100 mg/l NS NS NT 0.109 0.107 Su6010 0.0150 mg/l NS NS NT 0.0520 0.0570 0.0 Su6010 1.00 mg/l NS NS NT 1.50 1.60 1 Su6010 1.00 mg/l NS NS NT 11.3 11.4 1 Su6010 1.00 mg/l NS NS NT 11.3 11.4 1 Su6010 1.00 mg/l S S ND 2(2) 3(3) 4 The not tested for detected analytes only. Re not tested	Sulfate	E375.4	1.0	7	250	220	¥	6.8	6.3	6.1	5.8	
Subono 1.00 mg/l NS NS NT 15.5 15.7 15.4 15.5 15.7 15.5 15.7 15.5 15.7 15.5 15.7 15.5 15.7 15.5 15.7 15.5 15.7 15.5 15.7 15.5 15.7 15.5	Leed	Su7421		Ž	9	સં	=	2	3	0.0050	₽	
Su6010 0.100 mg/l .3 .3 NT 0.109 0.107 Su6010 1.00 mg/l NS NS NT 5.62 5.74 5 Su6010 1.00 mg/l NS NS NT 1.50 1.60 1 Su6010 1.00 mg/l NS NS NT 11.5 11.4 1 Su6010 1.00 mg/l NS NS NT 11.3 11.4 1 Su6010 1.00 mg/l NS NS NT 11.3 11.4 1 Su6010 1.00 mg/l S S ND 2(2) 3(3) 4 Then Su6010 1 ug/l 5 s ND 2(2) 3(3) 4 The not tested for detected analytes only. The not tested substitute only. B: analyte detected in blank The not detected.	Calcium	Su6010	5.8	1 / 2	SH	SE	Ξ	15.5	15.7	15.6	14.7	
Su6010 1.00 mg/l MS MS MT 5.62 5.74 5 5 846010 0.0150 mg/l 0.05 0.05 MT 0.0630 0.0570 0.0 0.0 0.0570 0.0 0.0 0.0570 0.0 0.0 0.0570 0.0 0.0 0.0570 0.0 0.0 0.0570 0.0 0.0 0.0570 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	lra.	SW6010	0.100	7	wi	ų	Ħ	0.109	0.107	웆	2	
Su6010 0.0150 mg/l .05 .05 NT 0.0630 0.0570 0.0 su6010 1.00 mg/l NS NS NT 1.50 1.60 1 the sub010 1.00 mg/l NS NS NT 11.3 11.4 1 then sub010 1 ug/l 5 ND 2(2) 3(3) 4 then tested for detected analytes only. B: analyte detected in blank	Megnesium	Su6010	9.1	2	SH	MS	TM	5.62	5.74	5.73	5.45	
Su6010 1.00 mg/l NS NS NT 1.50 1.60 1 Su6010 1.00 mg/l NS NS NT 11.3 11.4 1 Su6010 1.00 mg/l S S ND 2(2) 3(3) 4 Su6010 1 ug/l S S ND 2(2) 3(3) 4 Substitute reported for detected analytes only.	Manganese	Sta6010		7	ક	Ŗ.		0.0630	0.0570	0.0510	0.0%	
oroethene SW8010 1.00 mg/l NS NS NT 11.3 11.4 1 oroethene SW8010 1 ug/l 5 5 ND 2(2) 3(3) 4 : Results reported for detected analytes only. B: analyte detected in blank e: malyte not tested in blank e: analyte not detected.	Potassium	Sta6010	<u>-</u> 8	<u> </u>	SZ	SE		1.50	3.5	1.50	1.6	
oroethene SM8010 1 ug/l 5 5 ND 2(2) 3(3) 4 : Results reported for detected analytes only. B: analyte detected in blank e: nalyte not tested in blank halfication limit f:	Sodium	Sta6010	1.00	7	SN	SE	=	11.3	11.4	11.4	10.5	
d for detected analytes only. B: analyte detected in blank a. J: estimated value, below quantification limit f:	Trichloroethene	SM6010	-	7	'	10	£	2(2)	3(3)	(4)4	2(3)	
B: analyte detected in blank J: estimated value, below quentification limit f:	MOTES: Beaulte recorted for	r detected	V	S K							• • • • • • • • • • • • • • • • • • •	:
ad. J: estimated value, below quentification limit f:	MT: enalyte not tested		}			nalyte dete		¥		e: equi	pment wash blan	
	MD: analyte not detected.				2 : °	timeted va	lue, below o	quantificat		f: fiel	d replicate	

NS: No standard criteria or action level currently axists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.1-3

BEALE AFB: WATER DATA 2ND ROUND SAMPLING 1989

ANALYTICAL RESULTS TAC'E FOR SITE

				Standards, Cr and Action Le	riteria evels (a)	1-C-1GW	1-C-26W	1-C-3GW	1-C-46W	1-C-56W	1-A-1GW
Parameter	Method	Detection Limit	Units	:	State	BAFB-0560 05/31/89	BAFB-0557 05/31/89	BAFB-0558 05/31/89	BAFB-0556 05/30/89	BAFB-0576 06/05/89	BAFB-0559 05/31/89
Specific Conductivity	£120.1	0.1	Carried Car	SR	006	181	256	522	722	220	
Temperature	E120.1	*/	des des	SE	SZ	21.0	21.0	21.0	21.5	21.0	
***	E150.1	N/N	ā	2-6	S	7.43	7.18	7.22	7.18	7.74	7.39
Alkalinity - Total	SH403	1.0	1/2	2	SZ	8.69	67.1	8.98	70.2	T.W	
Bicarbonate	S#403	0.	7	SE	SH	85.2	81.9	105.9	85.6		
Total Dissolved Solids	E160.1	3.0	1 /02	200	200	322	240	261	257	232	
Chloride	£325.3	1.0	7/2	0 2 2	250	13.9	32.8	23.4	29.3	14.7	
Fluoride	E340.2	0.050	7	~	1.4	0.24	0.19	0.28	0.23	0.29	
Zitrate + Mitrite	E353.3	0.020	Š	5	45	7.4	4.7	6.2	3.9	7.2	
Sul fate	E375.4	1.0	1/2	952	250	9.9	7.1	14.7	13.1	10.3	
Calcium	Sw6010	5.8	1	SE	SZ	10.8	13.4	13.8	11.7	14.0	
Megnesium	\$46 010	9.1	5	SE	¥	5.8	6.52	8 .00	6.17	67.9	
Potassium	Suc 010	8.6	1/02	SE	SX	3.5	ار	1.62	98.4	1.40	
Sodium	Su6010	9.5	7	SE	SZ	18.3	28.8	54.9	30.0	20.3	
2 inc	Stu6010	0.0500	Ž	0.110	0.012	2	2	0.0330	욡	웊	_
trans-1,2,-Dichloroethene	SW8010	-) 	SE	SH	2	2	66(3)	욯	∞	
Trichloroethene	SWB010	-	7	s	Ś	2	2	14(22)	웆	(4)4	
Toluene	SWB020	-	1/80	14,300	5	2	욮	7	2	8	
M-Nitrosodiphenylamine (1)	SW8270	2	7/85	SE	SZ	•	7	9	2	2	_
bis(2-Ethylhexyl)Phthalate	SW8270	5	1/80	SH	S	4	9	m	2	9	

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) (): values listed in () are 2nd column confirmation values. MOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

* Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

				1							
				standards, Ci and Action Le	Criteria Levels (a)	1-0-100	1-C-1SW	1-c-25W	1-C-35W	1-C-4SH	
Parameter	Method	Detection Limit	units	Federal	State	BAFB-0586 06/09/89	BAFB-0599 06/14/89	BAFB-0600 06/14/89	BAFB-0601 06/14/89	BAFB-0602 06/14/89	
Specific Conductivity	E120.1	1.0	umhos/cm	MS	8	320	28	393	967	415	•
Temperature	E170.1	4/8	Sap C	¥8	¥S	27.0	21.5	22.0	22.0	23.0	
ā	E150.1	4/	Ŧ	2-9	SE	7.4	7.8	7.76	7.57	7.3	
Alkalinity - Total	SP14.03	1.0	/01	2	SR	7.96	4.8	122.0	121.0	119.4	
Bicarbonate	SEEK 0.3	1.0	7	S¥	SE	117.6	117.6	148.8	147.6	145.7	
Total Dissolved Solids	E160.1	3.0	1/0	200	200	208	307	313	388	315	
Chloride	£325.3	1.0	Ž	0 \$ 2	220	297	55.4	52.5	52.9	52.0	
Fluoride	E340.2	0.050	~ *	~	1.4	0.15	0.23	97.0	0.24	0.24	
Mitrate + Mitrite	£353.3	0.050	7	5	45	1.2	1.2	0.95	2.1	4.1	
Sulfete	E375.4	1.0	Ž	520	220	16.5	12.8	13.1	13.1	12.6	
TFH-Diesel	TFH-DI	0.020	Ž	KS	SN	9	2	2	0.020	2	
TFH-Gas	TFH-GA	0.10	7	SE	SH	2	2	9	2	0.20	
Barica	Su6010	0.100	7/0	SN	SH	0.163	0.129	0.136	0.138	0.153	
Calcium	SW6010	. 8	7/0	SH	SH	27.8	- % 	35.3	35.1	35.0	
Iron	Su6010	0.100	<u>></u>	r:	M.	9	0.112	2	0.145	0.188	
Magnes i un	SW6010	 8	7	SH	S¥	8.97	13.2	13.0	12.6	12.6	
Honganese	SW6010	0.0150	7	ę.	ક	0.210	0.0540	0.0340	0.181	0.227	
Potassium	SW6010	9.1	7	SE	S	2.60	2.70	3.20	3.10	3.50	
Sodium	Su6010	-8	7	SH	SE	19.7	 *	32.5	32.2	32.4	
Zinc	SW6 010	0.0200	7/00	0.110	0.012	0.0420	웆	0.0200	0.0220	0.0250	
Methylene chloride	SWB010	•	7	SE	S	9(14)	욮	2	9	2	
Trichloroethene	SMB010	_	7/60	5	Ś	3(4)	욮	9	9	2	
M-Nitrogodiphenylamine (1)	SW8270	2	7	SE	SZ	8 2	36	3	3	2	
					1						

NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

ND: analyte not detected in () are 2nd currently exists.

ND: field blank (ambient condition blank)

R: resample

ND: values represent most stringent standard, criteria or action level. See Appendix 1.

The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. for Mitrate + Mitrite given as Mitrate.

TABLE 4.1.1-3

BEALE AFB: MATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 1

				Standards, and Action	Criteria Levels (a)	1-0-164	1-C-2GW	1-c-264 ^k		1-c-3GV ^R	1-0-464
Parameter	Method	Detection Limit	units	Federal	State	BAFB-0645 09/14/89	BAFB-0640 09/13/89	BAFB-0677 11/02/89	BAFB-0641 09/13/89	BAFB-0679 11/03/89	BAFB-0643 09/14/89
Specific Conductivity	E120.1	0.1	Latios/cm	SH	8	57			221	=	220
Temperature	E170.1	M/A	dep C	SN	SE	22.0		Ħ	21.0	H	22.0
1	E150.1	4/8	ā	8-9	SN	7.58	7.37	H	6.65	Ħ	7.41
Alkalinity - Total	SPK03	1.0	7	2	SI	105.0		H	81.0	Ħ	73.8
Bicarbonate	SH403	1.0	7	S	SZ	128.1		H	98.8	H	8.0
Total Dissolved Solids	E160.1	3.0	/	200	200	247			270	Ħ	232
Chloride	E325.3	1.0	7	220	220	20.0		H	76.0	H	22.0
Fluoride	E340.2	0.020	1/0	8	1.4	0.21		H	0.22	H	0.20
Hitrate + Hitrite	E353.3	0.020	7	•	45	7.5		Ħ	6.1		5.4
Sulfate	E375.4	1.0	\	22	052	7.3		×	8.0	H	7.4
Catcium	SIM6010	9.1)/du	SE	SH	9.93		*	13.8	H	10.4
Megnesium	Sta6010	9.5	1/0	SH	SE	5.55		H	8.02		5.28
Hanganese	Stat6010	0.0150	7	8	9	2		H	0.0180	H	욮
Nicket	SW6010	0.0400	7	.16	4.	2		Ħ	0.000	¥	€
Potassium	Sta6010	9.1	7	S	SE	2.20		Ħ	2.30	H	2.20
Sodium	Sta6010	9.1	7	S	SE	16.7		H	21.6	H	78.7
Trichloroethene	Su 2 010	•	1/80	ß	Ś	2		2	Ħ	(5)	윺
Toluene	SINB020	-	7/85	14,300	<u>5</u>	~		2	Ħ	2	2
M-Witrosodiphenylamine (1)	SNB270	2	7/8n	SN	SN	5	_	TW.	R	Ħ	2
										1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. NT: analyte not tested ND: analyte not detected.

(): values listed in () are 2nd column confirmation values. NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The faderal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

for Mitrate + Mitrite given as Mitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.1-3 (continued)

		•		Standards, and Action	Criteria Levels (a)	1-C-5GW	1-A-1GV	V8-C-1⊊V	08-C-2GH	1-C-1DC	1-C-15W
Parameter	Method	Detection Limit	n Units	Federal	State	09/14/89	8AFB-0644 09/14/89	6AF6-Uo/1 09/25/89	BAFB-06/5 09/26/89	8418-00/6 09/27/89	8AFB-066/ 09/22/89
Specific Conductivity	E120.1	1.0	umhos/cm	SZ	8	702	221	8	-	394	381
Temperature	E170.1	M/A	2 6 6	S	SH	21.0	21.5	Ħ	H	19.0	23.0
. 1	E150.1	N/N	7	8-9	S	7.4	7.58	Ħ	H	7.37	98.9
Alkelinity - Total	SP4.03	1.0	1/02	2	SH	80.8	77.8	F #	H	137.6	117.0
Bicarbonate	204 03	1.0	1/02	SH	SH	98.6	٠. لا	H	H	167.9	142.7
Total Dissolved Solids	E160.1	3.0	7	200	200	219	324	=	1	97	Ž
Chloride	E325.3	1.0	/	220	220	43.0	19.0	H	H	45.7	50.0
Fluoride	E340.2	0.050	1/00	~	1.4	0.23	0.19	Ħ	Ħ	0.23	0.35
Mitrate + Mitrite	E353.3	0.050	7	, 0	45	7.4	5.6	H	H	0.22	2
Sulfate	E375.4	1.0	7	220	220	8.0	11.0	H	H	7.9	12.0
TFH-Diesel	TFH-DI	0.020	1/0	SI	SH	9	2	H	H	0.39	0.34
1FH-Gas	TFH-G	0.10	7	SE	SH	2	웊	Ħ	7	0.76	0.80
Aluminum	S46010	0.500	7	S	SH	욮	0.245	H	I	₽	₽
Berium	St#6010	0.100	7	SZ	SH	윭	윺	-	N	¥	0.144
Calcium	SW6010	 8.	Ž	SH	SH	14.4	11.6	H	H	56.9	29.5
Iron	SW6010	0.100	7	w.	'n	⊋	0.392	H	H	₽	2
Magnes i um	Su6010	2.0	7	SE	SN	9.80	5.85	=		11.4	12.1
Manganese	SW6010	0.0150	>	8	કં	2	9	Ħ	Ħ	0.198	0.741
Potassium	Sta6010	9.	7	SE	SH	2.00	2.8	1	¥	3.10	4.10
Sodium	Sta6010	9:	7	SE	SE	19.5	27.8	=	Ħ	43.0	7.62
zinc	SW6010	0.0200	7	0.110	0.012	9	₽	H	Ħ	0.0310	0.0560
trans-1,2,-Dichloroethene	SW6010	-	7	S#	SE	5	⊋	2	윾	₽	2
Trichloroethene	Su6 010	-	7/97	'n	'n	3(2)	3(3)	2	2	2(2)	2
Toluene	SMB020	-	7	14,300	5	₽	m	H	Ħ	_	9
M-Witrogodiphemylamine (1)	SW6270	2	3	SZ	SH	'n	2	H	H	2	2

NOTES: Results reported for detected enalytes only.
NT: analyte not tested
ND: analyte not detected.
NS: No standard criteria or action level currently exists.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l

e: equipment wash blank f: field replicate R: resample

for Witrate + Witrite given as Witrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Method E120.1 E170.1 E150.1 E160.1 E325.3 E340.2 E340.2	Limit Limit 1.0 d 1.0 d	Units Mos/cm deg C ph mg/l mg/l	Standards, Cri and Action Lev Federal	Criteria Levels (a) State	1-C-2SW BAFB-0668 09/22/89	1-C-3SW BAFB-0669	1-C-4SW
Method E120.1 E170.1 E150.1 E160.1 E325.3 E340.2 E375.4	_ ' >	Units thos/cm deg C pH mg/l mg/l	Federal	State	BAFB-0668 09/22/89		BAFB-0670
E120.1 E170.1 E170.1 E170.1 E160.1 E160.1 E175.4 E175.4	; 3	mos/cm deg c per mg/l mg/l	VA				09/25/80
E170.1 E150.1 E4603 E160.1 E325.3 E375.4 E175.4	•		2	8	391	387	385
E150.1 89463 89463 1ved Solids E160.1 E325.3 E340.2 E375.4 TFH-DI		£ 7 7 7 7	SH	S	24.0	24.0	24.0
84603 84603 6160.1 6325.3 6340.2 6375.4 178-61	000	3333	2-9	¥	6.8 0	6.69	7.13
8463 6160.1 6325.3 6375.4 178-01	0.	777	8	Ş	127.0	130.0	129.0
E160.1 E325.3 E340.2 E375.4 TFH-D1		7	SE	S	154.9	158.6	157.4
E325.3 E340.2 E375.4 TFH-DI	2		8	8	356	357	359
E340.2 E375.4 TFH-D1	1.0		X	ž	52.0	52.0	20.0
E375.4 TFN-01	0.050	Ž	~	* :	9.30	0.40	0.43
TFR-01	0,1	7	, S	S S	1.0	8.4	8.5
TENT	0.050	Ž	S	Ş	0.18	0.41	0.88
	0.10	Ĭ	S	S	77.0	9.60	0.38
946010	0,100	Ž	S	Ş	0.146	0.145	0.145
010975	00.	7	Ş	S	29.7	9.62	٥. چ
Sur6010	0,100	Š	r;	'n	0.100	2	2
946010	8	Ž	SE	Ş	12.3	12.3	12.5
010344	0.0150	/	8	ક	0.490	0.289	0.261
010978	8	Š	SE	S	3.50	3.60	8.4
S46010	8	Ž	SE	S	30.2	30.5	8
010975	0.0500	7	0.110	0.012	0.0390	0.0590	0.0370
Su 6 010	_	3	.	S	₽	1(2)	5(2)
S148270	9	7	SE	S	9	•	- 9 -

MT: analyte not tested

MD: analyte not detected.

MD: as timed of it field replicate to a stimulation level. See Appendix I.

MD: values represent most stringent standard, criteria or action level. See Appendix I.

MD: values represent most stringent standard, criteria or action level. See Appendix I.

MD: values represent most stringent standard of 45 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. e: equipment wash blank f: field replicate R: resample B: enalyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) MOTES: Results reported for detected analytes only.

TABLE 4.1.1-3

BEALE AFB: MATER DATA 4TH ROLMD SAMPLING 1989

AMALYTICAL RESULTS TABLE FOR SITE 1

		;		Standards, and Action	Standards, Criteria and Action Levels (a)	1-C-16W	1-c-2GV	1-C-3GV	1-C-4GH	1-C-5GN	1-A-1GW
Perameter	Hethod	Detection Limit	Chits	Federal	State	11/22/89	11/21/89	11/21/89	11/21/89	11/22/89	#AFB-0713 11/28/89
Specific Conductivity	E120.1	1.0		SE	8	-	546	200	230	219	862
Temperature	£170.1	4/1	9	SH	SH	H	21.0	20.5	21.0	21.0	21.0
	£150.1	٧/٣	Ŧ	5-9	SH	7.00	7.38	7.35	7.35	8.90	7.53
Alkalinity - Total	SP4 03	1.0	Ž	2	SI	20.2	2.89	76.8	70.0	78.0	82.0
Bicarbonate	S0448	1.0	Ž	Ş	SE	85.6	83.2	93.7	85.4	8.5	100.0
Total Dissolved Solids	£160.1	3.0	7	200	26	222	292	273	281	241	652
Chloride	£325.3	1.0	Ž	0 \$2	\$	12.2	32.4	16.4	30.8	13.7	18.2
Fluoride	E340.2	0.020	7	~	1.4	o.30	0.23	0.32	0.27	0.32	0.28
Mitrate + Mitrite	E353.3	0.020	7	5	\$	4.1	1.3	5.4	2.1	2.0	2.6
Sulfate	E375.4	1.0	Ž	<u>\$</u>	<u>\$</u>	11.9	1.4	7.3	4.9	5.3	12.6
peal	Su7421	0.0050	Ž	Š	ę.	2	2	9	2	2	0.0089
TFH-Diesel	TFH-DI	0.020	Ž	S¥	S	2	0.060	0.060	9	9	0.10
Calcium	Suc 6010	. 8	7	SZ	SW	10.2	12.2	13.1	11.3	12.8	11.8
Chromica	Stu6 010	0.0300	Ž	SZ	S	2	2	2	2	2	0.0311
Iran	Stu6010	0.100 001	Ž	r.	'n.	9	2	2	₽	9	98.9
Magnesium	Stu6 010	8.	Ž	SZ	SZ	2.62	6.17	7.52	5.78	6.17	6.19
Manganese	SW6 010	0.0150	Ž	ક	s.	9	2	9	9	2	0.142
Mickel	Su6010		Ž	91.	∢.	2	욡	0.0575	2	2	2
Potassium	Sta6 010	5.8	Ž	SH	SE	39.1	2.05	1.87	1.92	1.49	2.19
Sodium	Stu6 010	. 8	Ž	S	Ş	18.2	30.2	22.4	8.62	19.4	56.9
Zinc	SW6 010	0.0500	Ž	0.110	0.012	2	9	2	2	£	0.0291
Trichloroethene	SUB 010	-	7	~	'n	9	₽	6(7)	9	3(5)	133
Toluene	3/10 020	-	7	14,300	5	윺	2	9	3(4)	2	9
Diethylphthelate	S148270	2	<u>7</u>	S	SH	20	7	- 9		9 78	78 80
M-Mitrosodiphenylamine (1)	SHB 270	2	7	S	SE	6	101	2	ō	BJ 7.	15 8
Di -n-Butyi phthelete	\$48270	2	<u>></u>	S	SE	8 9	7		80	8. Z	17 8
bis(2-Ethylhexyl)Phthalate	SNB270	2	<u>Ş</u>	S	S R	9	8	Š	2	2	9
MOTES: Results reported for detected analytes only.	detected	enelytes o	alv.	1 1 1 1 1 1 1 1	: : : : : : : :						
MT: analyte not tested		•	•	=	analyte detected in blank	cted in blan	*		e: equi	equipment wash blank	i enk
ND: analyte not detected.				ä	estimated value,	lue, below q	below quantification	on timit	f: field	field replicate	
MS: No standard criteria or action level	action le	u	urrently exists.	ق : . :	field blank (ambient condition blank)	(ambient con	dition blar	Ķ)	R: resample	aple	

NT: analyte not tested
ND: analyte not detected.
NS: No standard criteris or action level currently exists.
(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

* The federal standard for Mitrate.

* The federal standard for Mitrate.

* Detection limits for each analysis are given in Appendix A.

TABLE 4.1.1-3 (continued)

				Standards, Card Action L	Criteria Levels (0)	08-C-16V	08-C-2GM	1-C-10C	1-C-1SW	1-C-25W	1-C-3SW	
	1	Detection	-			BAFB-0740	BAFB-0739	BAFB-0736	BAFB-0732	BAFB-0733	BAFB-0734	
Perameter	Method		2010	recerai	State	16/11/04	12/11/09	16/10/109	16/00/01	12/00/09	40/00/21	
Specific Conductivity	£120.1	1.0	Carros/ca	SH	8	219	2750	8	240	250	261	
Temperature	E120.1	W/A	Oeg C	SR	N	19.0	16.5	11.5	7.5	9.5	11.0	
5	£150.1	4/	₹	2-9	SH	7.36	6.9	2.7	7.61	7.73	7.71	
Alkalinity - Total	S144.03	0.0	1/0	20	S#	H	1.84	114.0	100.8	101.4	107.4	
Bicarbonate	274 03	1.0	<u>`</u>	S	SH		Ħ	139.1	123.0	123.7	131.0	
Total Dissolved Solids	£160.1	3.0	7	200	200	Ħ	Ħ	219	50 6	216	191	
Chloride	E325.3	1.0)	250	220	Ħ	H	47.2	45.3	43.3	45.1	
Fluoride	E340.2	0.020	7	7	1.4	H	H	07.0	67.0	0.51	0.51	
Witrate + Mitrite	£353.3	0.020	7/2	•01	4 5	Ħ	Ħ	0.25	0.71	98. 0	0.31	
Sulfate	E373.4	1.0	7	250	250	H	H	5.2	8.7	7.0	5.5	
TFM-Diesel	TFH-DI	0.020	ì	SN	N	H	12	2.3	9	0.11	0.19	
Berica	Su6010	0.100	7	SH	SM	H	12	0.102	0.104	0.105	0.104	
Celcius	Su6010	. 8	1/2	SE	NS	TM	IN	25.5	25.9	25.5	25.1	
Lon	Sta6010	0.100)	r.	ĸ.	×	Ħ	2	0.105	0.159	2	
Megnes i um	Su6010	8	7	S#	SE	H	Ħ	11.2	10.8	10.7	10.9	
Manganese	SN6010	0.0150	<u> </u>	ę.	કં	H	¥	0.0468	0.106	0.132	0.0394	
Potassium	Su6010	8	7	SH	SN	Ħ	H	2.68	2.53	2.42	5. 7.	
Sodium	Su6010	.00	7	SR	SN	LX	Ħ	7.97	24.8	25.3	79.7	
Zinc	SN6010	0.0500	7	0.110	0.012	Ħ	Ħ	0.0248	0.0227	0.0320	0.0481	
Trichloroethene	Su 6 010	-) (8)	•	•	1(0)	2	1(2)	2	9	3(1)	
Toluene	SNB020	-	1/85	14,300	50	H	H	1(9)	2	5	9	
N-Nitrosodiphenylamine (1)		5	1/80	SH	SE	TM.	T.W.	욯	2	~	76	

NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

ND: detected in blank

ND: stimular for literary action level.

ND: values represent most stringent stendard, criteria or action level.

ND: values represent most stringent stendard, criteria or action level.

ND: values represent most stringent stendard, criteria or action level.

ND: values represent most stringent stendard, criteria or action level.

ND: values represent most stringent stendard, criteria or action level.

ND: values represent most stringent stendard, criteria or action level.

ND: values resumple

TABLE 4.1.1-3 (continued)

				Standards, Criteria and Action Levels (a)	Criteria Levels (a)	1-C-4SH	
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0735 12/07/89	
Specific Conductivity	E120.1	1,0	umbos/cm	SN	8	295	
Temperature	E170.1	V / H	o de d	SE	SX	11.5	
- E	£150.1	N/N	T	2-9	SN	8.7	
Alkalinity - Total	SER 03	1.0	1/02	70	SN	112.6	
Bicarbonate	S#4 03	1.0	<u> </u>	SE	SN	137.4	
Total Dissolved Solids	£160.1	3.0	7/04	200	200	204	
Chloride	E325.3	1.0	7	250	250	47.0	
Fluoride	E340.2	0.050	1/02	7	1.4	07.0	
Nitrate + Mitrite	£353.3	0.050	1/01	10*	45	0.18	
Sulfate	E375.4	1.0	7/0	250	250	5.5	
TFM-Diesel	TFH-DI	0.050	7	SH	S.N	0.82	
Barica	Su6010	0.100	7	SN	SX.	0.102	
Calcium	SW6010	7.00	7/2	S¥	S¥	25.3	
Magnesium	Su6010	- 8.	7	SH	SZ	11.1	
Manganese	SW6010	0.0150	/01	ક.	S	0.0472	
Potassium	SW6010	8.	/	SN	SN	2.86	
Sodium	SW6010	8.	/2	SE	SN	26.3	
2 inc	Su6010	0.0200	<u> </u>	0.110	0.012	0.0285	
Trichloroethene	SuB010	-	7	S	S	8(2)	
Toluene	SHB020	-	~\ 9 5	14,300	5	1(8)	

MOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Table 4.1.1-4
RANGES OF CONTAMINANTS DETECTED AT SITE 1

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
DISCHARGE TO DITCH			• • • • • • • • • • • • • • • • • • • •	
TFH-diesel	mg/l	ND	9.0	3/4
THF-gas	mg/l	ND	0.76	2/4
manganese	mg/l	0.198	0.34	4/4
trichloroethene	ug/l	ND	1	1/4
SURFACE WATER				
TFH-diesel	mg/i	NO	200	9/16
TFH-gas	mg/l	ND	2.0	6/16
lead	mg/l	ND	0.0050	1/16
iron	mg/l	ND	0.188	8/16
manganese	mg/l	0.034	0.741	16/16
trichloroethene	ug/l	ND	8	8/16
STREAM SEDIMENTS				
TFH-Clusel	mg/kg	ND	15,000	22/24
FFH-gas	mg/kg	NO	430	13/24
eadmium	mg/kg	ND	4.4	5/24
chromium	mg/kg	22.6	132	24/24
l ead	mg/kg	ND	269	16/24
zinc	mg/kg	ND	380	14/24
toluene	mg/kg	NO	0.46	11/24
trichloroethene	mg/kg	ND	0.013	5/24
ois(2-ethylhexyl) phthalate	mg/kg	ND	14	6/24
penzo(a)anthracene	mg/kg	ND	4.3	5/24
penzo(a)pyrene	mg/kg	ND	3.9	3/24
penzo(b)fluoranthene	mg/kg	ND	6.3	2/24
penzo(k)fluoranthene	mg/kg	ND	2.9	1/24
chrysene	mg/kg	ND	7.9	6/24
fluoranthene	mg/kg	ND	12	2/24
N-nitrosodiphenylamine	mg/kg	ND	(0.13)	4/24
ohenanthren e	mg/kg	ND	4.3	3/24
pyrene	mg/kg	ND	9.2	6/24
GROUNDWATER			•	
toluene	ug/l	ND	3	7/28
trans-1,2-dichlcroethene	ug/l	ND	66	3/28
trichloroethene	ug/l	ND	14	11/28

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the ${\tt LOQ}_{\star}$

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study, the LOQ is equal to the detection limit as defined in the QAPP.

4.1.1.2 Sampling and Analytical Problems

4.1.1.2.1 Loss of Samples

There were no sample loss problems for Site 1 samples. Two analyses scheduled for Site 1 samples were not completed due to laboratory handling problems. One TFH-gas analysis was not completed for the first quarter groundwater sample from well 1-A-1, and a semivolatile organic analysis was not completed for the upper sample at 1-C-1SS. Neither of these analyses omissions is considered critical to data evaluation or evaluation of site conditions. In the third quarter, samples from wells 1-C-2 and 1-C-3 exceeded holding times for purgeable halocarbons and purgeable aromatics analyses. These were resampled and analyzed within holding times.

4.1.1.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 1 contained several organic compounds that were probably laboratory-induced false positive results. Methylene chloride was the most common volatile organic compound; it was detected in virtually all field samples and also in all method blanks. Acetone and carbon disulfide were detected in several samples and associated method blanks.

For semivolatile analyses conducted on soil, phenol was detected in field samples and in associated method blanks. Phenol was detected in 12 samples (both the 0- to 0.5-foot and 1.5- to 2.0-foot samples at locations 1-C-1 to 1-C-6) at concentrations of 1.0 to 3.5 mg/kg. This has been traced to a factory-contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the average induced contamination was 1.7 mg/kg. Other semivolatile compounds detected in some soil samples and method blanks included bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, and di-n-butyl phthalate.

One equipment wash blank did contain TFH-diesel at 0.10 mg/l, which is twice the detection limit. However, TFH-diesel was not detected in either the field sample or the field duplicate sample taken immediately before the equipment wash blank. Therefore, the TFH-diesel in the equipment wash blank is considered a false positive result.

In the third sampling round, one method blank did contain TCE at 1 ug/1, which equals the detection limit. TCE was detected in the corresponding sample 1-C-1DC, and second column confirmation at 2 ug/1 each. The source of TCE in the method blank is not known.

4.1.1.2.3 Analytical Results Obtained under Out-of-Control Conditions

In the third quarterly groundwater sampling, the 8270 analysis for well 1-C-2 had a phenol-d5 surrogate spike recovery of 100 percent which exceeded the acceptable range of 10 to 94 percent. For well 1-C-3, the nitrobenzene-d5 surrogate spike recovery of 120 percent exceeded the acceptable range of 35 to 114 percent. In the fourth round 8010 analysis for 1-C-3GW, 1-C-4GW and 1-C-5GW the bromochloromethane surrogate spike recoveries of 136, 149, and 146 percent exceeded the acceptable range of 70 to 130 percent.

4.1.1.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.1.3 Significance of Findings

Surface Water

In the first quarter, surface water sampled from the West Drainage Ditch contained TCE in all four samples at concentrations ranging from 2 to 4 ug/l. TCE was not detected in the discharge water flowing into the ditch, although the sample was taken from the northernmost culvert where most of the discharge was occurring, and was not composited from all three culverts. In the second round samples, TCE was detected in the discharge sample but not the downstream samples. In the third round, TCE was detected at 1 to 2 ug/1 in the discharge and two nearest downstream samples but was not detected in the two farthest downstream samples. In the fourth round, TCE was detected at 1 ug/l in the discharge sample and 8 and 3 ug/1 in the next two downstream samples, but was not detected in the two farthest downstream samples. The varied concentrations of TCE are to be expected in quarterly surface water samples. The EPA drinking water

standards MCL for TCE is 5 ug/l, as is the DHS action level. The EPA MCL goal is zero. The acute toxicity level per the EPA National Ambient Water Quality Criteria to Protect Freshwater Aquatic Life for TCE is 45,000 ug/l and the level that may cause toxicity to one species (unstated) is 21,900 ug/l. The TCE levels detected in the surface water samples at Site 1 are below the DHS action levels but above the EPA MCL goal of zero.

Discharge flowing into the ditch from the north culvert contained TFH-diesel and TFH-gas in the first sampling round. Surface water sample 1-C-4SW also contained TFH-diesel at 200 mg/l and TFH-gas at 2 mg/l, which was several times higher than the discharge water. Samples taken downstream of 1-C-4SW had no detected TFH-diesel or -gas. The three absorbent booms may be absorbing diesel and gas as a floating free phase and could, therefore, reduce the levels of TFH observed in downstream samples. In the second round, TFH-diesel was detected only in the nearest downstream sample and TFH-gas only in the next downstream sample. In the third quarter, TFH-diesel was detected in all samples at from 0.18 to 0.88 mg/1. TFH-gas was detected in all samples at from 0.38 to 0.80 mg/1. These results suggest that TFH-diesel and gas were getting past the absorbent booms during the third quarter sampling. In the fourth round TFHdiesel was detected at decreasing levels from the discharge to the third downstream sample (2.3, 0.82, 0.19, and 0.11 mg/l) and was not detected in the farthest downstream sample. These results suggest that most of the TFH-diesel compounds were being contained by the absorbent booms.

Toluene was not detected in any of the first three quarterly surface water samples. In the fourth quarter, toluene was detected in the discharge (1 ug/1) and downstream samples 1-C-4SW and 1-C-2SW at 1 ug/1.

Barium was detected in some surface water samples but not groundwater samples; iron, manganese, and zinc were detected in some surface and some groundwater samples. These metals may originate with flightline activities and be transported to Site 1 in stormwater, but are not considered to be contaminants of concern. In the first quarter, the highest concentration of iron was 0.109 mg/l (109 ug/l), which is below the EPA secondary MCL of 300 ug/l suggested to protect beneficial uses. Manganese was detected up to 0.063 mg/l (63 ug/l), slightly above the EPA secondary MCL of 50 ug/l.

In the second quarter samples, iron ranged from not detected to 0.188 mg/1 and manganese increased, ranging from 0.034 to 0.227 mg/1. In addition to iron and manganese, barium was

detected in all samples at from 0.129 to 0.163 mg/l, which is below the EPA drinking water standards MCL of 1.0 mg/l. Zinc ranged from below the LOQ to 0.042 mg/l, below the EPA secondary MCL of 5.0 mg/l.

In the third quarter, iron decreased, being detected only at the 0.100 mg/l LOQ in 1-C-2SW. Manganese increased, ranging from 0.198 mg/l in the discharge sample to 0.741 mg/l in the farthest downstream sample. Barium was not detected in the discharge but was uniform in the four downstream samples, ranging from 0.144 to 0.146 mg/l. Zinc was detected in all samples at from 0.031 to 0.059 mg/l.

In the fourth quarter manganese was detected at 0.047 mg/l in 1-C-1DC and 1-C-4SW, 0.039 mg/l in 1-C-3SW, 0.132 mg/l in 1-C-2SW, and 0.106 mg/l in 1-C-1SW. Iron was only detected in the two downstream samples at 0.159 mg/l in 1-C-2SW and 0.105 mg/l in 1-C-1SW. Barium ranged from 0.102 to 0.105 mg/l in all five surface water samples. Zinc ranged from 0.023 to 0.032 mg/l in all five samples. This variability of results is common in quarterly surface water sampling. Manganese was the only metal detected above any MCL and that is a secondary MCL, based mainly on staining characteristics rather than health risks.

Soil

All but 2 of the 24 stream sediment samples (12 locations, 2 samples each location) from the West Drainage Ditch had detectable levels of TFH-diesel. In all cases, the diesel fuel components were detected in the upper and the lower samples at each location. As expected, at most of the sampling locations the highest concentration was detected in the zero to 0.5-foot sample. The highest concentration (15,000 mg/kg) was detected at the third sampling point downstream from the headwall and, therefore, the expected decrease in concentration as a function of distance from the source was not strictly observed. However, the lowest concentration of diesel components at any one sampling cross section (six samples) was at the farthest downstream cross section. The calculated LUFT cleanup standard for TFH-diesel is 1,000 mg/kg.

Thirteen of the 24 sediment samples had detectable levels of TFH-gas. Three of the samples with detected TFH-gas were from the upper sample, with no TFH-gas detection in the lower sample. The highest concentration of TFH-gas (430 mg/kg) was also in the third sampling group downstream of the headwall. TFH-gas concentrations generally cor

related with diesel concentrations and no gasoline components were detected in the farthest downstream cross section sample group. The LUFT TFH-gas cleanup standard for Site 1 is 100 mg/kg.

Toluene was detected above the LOQ in six surface sediment samples at concentrations ranging from 0.008 to 0.46 mg/kg. Five samples had toluene detections at estimated concentrations below the LOQ from 0.007 to 0.45 mg/kg. Some of the samples had unusually high LOQs due to required dilutions during analysis. Although toluene concentrations did not correlate linearly with TFH concentrations, the samples with detected toluene were primarily those samples with the highest concentrations of TFH. There currently is no state TTLC criteria for toluene; the LUFT cleanup standard calculated is 0.3 mg/kg.

Lead, detected in only one background soil sample at other sites on base (at 24.2 mg/kg), was detected in 16 of the sediment samples at concentrations from 29.3 to 269 mg/kg. Leaded aircraft and motor vehicle fuels are the probable source. As with toluene, lead concentrations were not directly correlatable to concentrations of TFH. Generally, lead was detected in the samples with highest concentrations of TFH and lead was not detected in any of the samples where TFH-diesel was below 100 mg/kg. The DHS TTLC for lead in soil is 1,000 mg/kg. The lead levels detected are below the TTLC.

Barium (1 sample), cadmium (5 samples), chromium (7 samples), and zinc (12 samples) were detected in sediment samples at levels more than two standard deviations above averaged background levels. With each of these metals, the concentrations decreased with sample depth. All detections were below respective DHS TTLC values.

Several semivolatile compounds were detected in some of the stream sediment samples (see Appendix A). Generally, these compounds were detected near or below the LOQ and, for some of the compounds (phenol, bis[2-ethylhexyl] phthalate, fluoranthene) were also detected in some method blanks. Semivolatile compounds were generally detected in the samples with highest concentrations of TFH compounds. DHS TTLC values for the detected semivolatile compounds in stream sediments are not available.

Groundwater

Groundwater at Site 1 contains TCE. TCE was detected in all four quarterly sampling rounds from 1-C-3, 1-C-5, and 1-A-1 at concentrations ranging from 2 to 8 ug/1, and second

column confirmation data are consistent with first column results except for 1-C-3 in the second round. TCE was detected at a higher level (14 ug/l, 22 ug/l in the second column) in the second round in 1-C-3 but dropped down to 4 and 6 ug/l in the third and fourth rounds. These wells are all shallow wells completed in the uppermost permeable zone, relative to deep wells 1-C-2 and 1-C-4 which are completed at a lower level in this permeable zone. TCE was not detected in the deeper wells or the background well at Site 1. The EPA drinking water standards MCL for TCE is 5 ug/l, as is the DHS action level. In previous studies at Site 1 (AeroVironment, 1987), TCE was detected in well 1-A-1 at concentrations of 100 and 58 ug/l. It is unknown why the concentration of TCE has apparently decreased so substantially.

Trans 1,2-Dichloroethene (DCE) was detected in well 1-C-3, only in the second sampling round, at 66 ug/l (but only 3 ug/l in the second column confirmation). The 66 ug/l value in the first column result is likely due to analytical interference rather than to the actual presence of that much trans 1,2-DCE.

The second column confirmation results are used to confirm the presence of a compound rather than to give quantitative results at low levels near the LOO.

Iron was detected above the California Secondary Drinking Water Standard of 0.3 mg/l in well l-A-l in the third quarter (0.392 mg/l) and the fourth quarter (6.88 mg/l).

4.1.1.3.1 Zones of Contamination

It is concluded that the environment near Site 1 is being impacted by TFH-diesel and TFH-gas, toluene, TCE, and metals. Based on information collected during Stage 2-1, three zones are known to be affected.

Surface water in West Drainage Ditch has been contaminated with TFH-diesel and -gas, and TCE. Concentrations were generally highest in the culvert discharge sample and upstream surface water sample except in the third quarter when downstream samples were in ranges similar to those of upstream samples.

Contaminants, transported to the West Drainage Ditch in the discharge from the culverts, are apparently migrating into the stream sediments and may be infiltrating to groundwater. Sediment samples contained the same analytes detected in surface water samples plus chromium, cadmium, and lead,

which were not detected in the surface water. Chromium and lead were also detected in well 1-A-1 in the fourth quarter. Within the sediment samples, the TFH concentrations generally decreased in the downstream direction and in the lower sample at each sampling point. Although the lower samples generally contained TFHs, the concentration was less than the upper sample indicating a decreasing TFH concentration with depth. Based on the information collected in Stage 2-1, the lower limit of sediment contamination has not been determined. It should be noted, however, that an unknown thickness of sediments was dredged from the stream sometime prior to sampling. It is unknown if the contaminants detected represent new impacts occurring since the time of the dredging, or if the contaminants represent residual impacts that existed below the dredged materials.

Groundwater in the uppermost aquifer at the site has also been affected, although the areal extent is unknown. Samples from the deeper wells and the background (shallow) well did not indicate contamination.

4.1.1.3.2 Contaminant Migration

Contaminants are believed to be moving generally to the southwest from Site 1. Three mechanisms are responsible for the migration. First, surface water contaminated with TFH-diesel, -gas, and TCE flows southwest within the West Drainage Ditch. This flows into an ephemeral stream channel downstream of Site 1, transporting the contaminants downstream.

Secondly, the West Drainage Ditch, like all of the surface waters present at the base, is probably a "losing stream"; that is, the water in the ditch is above the groundwater table. This means that water within the ditch has the potential to infiltrate downward to the water table. Where this infiltration occurs, contaminants in the surface water can be carried through the sediments and soil towards the groundwater. The TFHs detected in the sediments are believed to have originated from the surface water, which may also be the source of TCE in the groundwater at shallow wells 1-A-1, 1-C-3, and 1-C-5 at Site 1. Whether the TCE in these wells is the result of TCE migration through soil at Site 1 or migration in groundwater from an upgradient source cannot be determined.

Thirdly, the groundwater near Site 1 flows to the southwest, towards off base areas of agricultural and private domestic supply wells. The results of the Stage 2-1 study indicate that TCE is reaching the uppermost permeable zone in the aquifer. There does not appear to be a significant downward vertical gradient within this uppermost permeable zone at

Site I as deep and shallow well pair 1-C-2 and 1-C-3 had no vertical gradient, while 1-C-4 and 1-C-5 had a 0.002 ft/ft downward gradient (Table 4.1.1-1). However, downward gradients may exist across zones of lower permeability deeper in the aquifer. It is not known if the contamination is migrating to the permeable zones from which nearby production wells derive water. The base water supply wells are screened in a number of zones extending down from about -27 feet NVGD to -245 feet NGVD. The upper part of these screened intervals lie at the same elevation as the deeper screened intervals at Site 1. Samples from monitoring wells 1-C-2 and 1-C-4, screened from about -25 to -45 feet NGVD, did not show any TCE. The two off-base domestic wells sampled during the third and fourth rounds also did not indicate the presence of TCE except for the unconfirmed 1 ug/1 in the first column analysis of the fourth quarter sample from OB-C-1.

4.1.1.3.2.1 Potential to Move Off Site and Off Base

The potential is high for the contaminants detected at Site 1 to move both off site and off base. The unnamed stream into which the West Drainage Ditch flows crosses the base boundary less than 3,000 feet from Site 1 and flows into Hutchinson Creek about 3 miles from the base boundary. Groundwater flows to the southwest from Site 1 towards the groundwater depression west of Beale AFB. However, no contaminants have been detected in off base wells downgradient from Site 1.

4.1.1.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Groundwater flows southwest from Site 1 at approximately 82 feet per year based on results of the 72-hour pump test in well 19-C-4 and local gradient information. The gradient, and thus rate of flow, may increase nearer the agricultural wells southwest of the site.

Many factors affect contaminant transport in groundwater, and most of these factors are not well defined for this project. Some of these factors act to shorten and some to lengthen the travel time of a contaminant in groundwater. Estimates of migration rates do not include allowance for such factors as diffusion, dispersion, adsorption, or chemical changes of the contaminants in the subsurface.

The estimated peak velocity of the unnamed stream receiving flow from the West Drainage Ditch is 5 feet per second based on observations made during storm flow.

4.1.1.3.2.3 Time of Travel to Receptors

At the estimated velocity of 5 feet per second, under storm conditions stream water will cross the base boundary about 10 minutes after flowing through Site 1. In periods of dry weather, the stream flow rate may be slower.

At the estimated flow rate of 82 feet per year, groundwater presently under Site 1 will not cross the base boundary for many years. Because it is not known when TCE first entered the groundwater near Site 1, and because the subsurface hydrogeology remains poorly defined in this area, it is unknown when the contaminants will cross (or have crossed) the base boundary.

4.1.1.3.2.4 Applicability of Solute Transport Models

Solute transport models may not be applicable at Site 1 due to the nonhomogeneous soil deposits typical of Beale AFB.

4.1.1.3.2.5 Expected Spatial and Temporal Variations in Concentration

In the Phase II, Stage 1 investigation, TCE was detected in shallow monitoring well 1-A-1 in two sampling rounds at 100 and 58 ug/1. During Stage 2-1, TCE has been detected in all shallow downgradient wells at lower consistent levels. Based on these observations, a spatial pattern is difficult to discern. Though the concentration appears to be decreasing with time at well 1-A-1, an accurate estimate of continued concentration variations cannot be made.

4.1.1.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.2 DISCUSSION OF RESULTS FOR SITE 2: PHOTO WASTEWATER TREATMENT PLANT

The photo wastewater treatment plant (PWTP) has been used since 1966 to treat photo development wastewater. The plant is located in the southwest portion of the base, approximately 3,000 feet from the base boundary and less than 1,000 feet from Hutchinson Creek. The PWTP receives wastes from the photo laboratory (Building 2145, 2.5 miles to the northeast) through a dedicated pipeline. Average wastewater flow is 20,000 gallons per day. Treatment processes include equalization, chemical flocculation, settling, and filtration. Two unlined sludge ponds have been used for PWTP sludge since 1974. The ponds are used alternately to allow sludge drying. In addition, three abandoned injection wells were used for PWTP effluent disposal until injection was discontinued in April 1986. The three injection wells were abandoned by the pressure-grout method in November 1989. The injection zone (1,000 to 1,200 feet below ground surface) is not part of past or current IRP studies.

Concern at Site 2 results from the unlined sludge ponds and past pentachlorophenate (PCP)-treated PWTP effluent discharging onto the ground around the PWTP and near the abandoned injection well heads. From 1967 until 1984, whenever the treatment plant shut down for maintenance, 500 to 2,000 gallons of effluent which had Dowicide G containing PCP added to it were discharged onto the ground surface in the vicinity of the abandoned injection wells. This procedure was conducted monthly to flush out corrosion in the pipelines, but has not been conducted since February 15, 1984. Thus approximately 100,000 to 400,000 gallons of PCP-treated effluent may have been discharged to the ground surface from 1967 to 1984. In the Phase II, Stage 1 study, PCP was detected at 30 mg/kg in one boring near abandoned Injection Well No. 2 at a depth of 16.5 feet.

In the Stage 2-1 study, six sediment samples were collected from the sludge ponds and eight surface soil samples were collected near the PWTP equipment pad. Seven soil borings were drilled at Site 2; one vertical background boring; one vertical boring near two of the three abandoned injection wells; two vertical borings near abandoned Injection Well No. 2; and one angled boring beneath each of two sludge ponds. One new monitoring well was constructed. This well and five existing wells were sampled quarterly. No surface water samples were collected at Site 2.

4.1.2.1 Presentation of Results

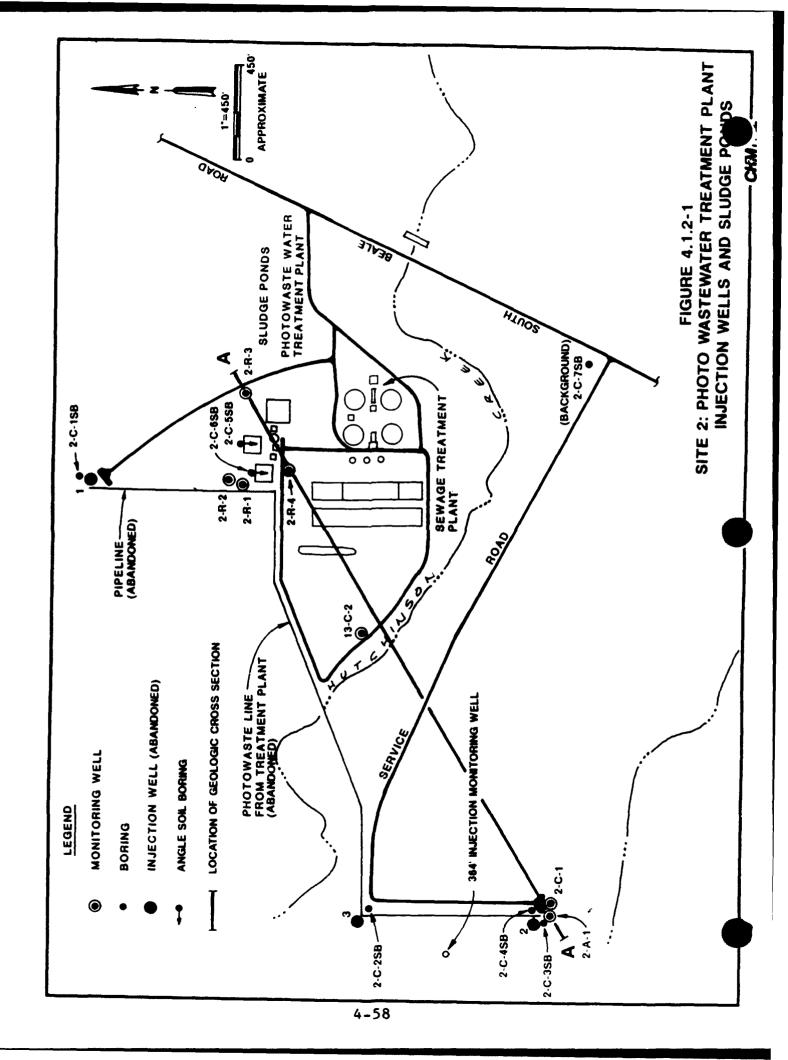
The following section presents the results of the field investigation at Site 2. The discussion will focus on the geology and hydrogeology at the site, and present the results of chemical analyses performed on samples of groundwater and soils.

4.1.2.1.1 Site Geology

Evaluation of the geology at Site 2 was based on boreholes and wells drilled during the Stage 2-1 investigation, on wells installed during the Phase II, Stage 1 investigation (AeroVironment, 1987), and wells monitoring the PWTP sludge ponds (Radian, 1985). During the Phase II, Stage 1 investigation, a monitoring well (2-A-1) was installed adjacent to abandoned Injection Well No. 2 and screened across the water table. During the monitoring well installation program (by Radian Corporation) at the sludge ponds, four wells (2-R-1 through 4) were constructed and screened across the water table. For the current investigation, seven borings were completed at Site 2. Four of these were vertical borings drilled to a total depth of 51.5 feet each. One was a vertical boring drilled to a total depth of 28 feet. Two were angle borings drilled at 30° from vertical beneath the sludge ponds to a vertical depth of 43 feet (drilled depth 50 feet). In addition, one monitoring well was installed (2-C-1) at abandoned Injection Well No. 2 and screened in a deeper zone than adjacent well 2-A-1. location of these wells and boreholes is shown on Figure 4.1.2-1. Soil boring logs for Stage 2-1 drilling are provided in Appendix D.

A cross-section constructed from soil boring logs of Site 2 and Site 13 wells is located on Figure 4.1.2-1 and shown in Figure 4.1.2-2. A schematic of soil types encountered in shallow soil borings is presented in Figure 4.1.2-3. A key to lithologic symbols is given in Appendix D. These figures show that soil in the vicinity of Site 2 is predominantly fine-grained, with isolated lenses of sand and gravel. It is impossible to make correlations among the boreholes, with the exception of paired wells 2-A-1 and 2-C-1. These wells are close to each other and only well 2-C-1 is shown on the cross section. Both of these wells penetrated clays and sandy clays throughout the vadose zone.

First water was contacted in a sand unit at a depth of about 92 feet BGS (-9 feet NGVD), later rising in the hole to about sea level. Beneath the sand, both boreholes encountered a clay unit which extended for 10 feet at about -20 feet NGVD. From this depth to the total 170 feet BGS depth of 2-C-1 (-87 feet NGVD), clays and water-bearing sands



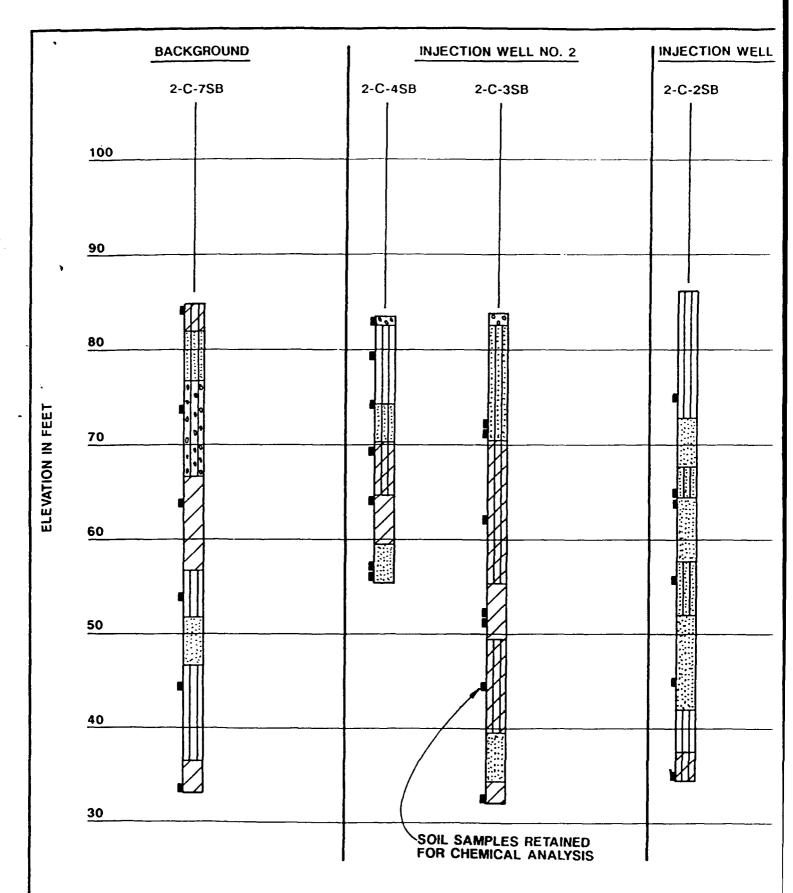
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alternated in the hole. Wells 2-R-1, -2, -3, and -4, installed by Radian Corporation for a study at the photo waste sludge ponds, encountered mainly clay, with occasional thin layers of sand or silt (Radian, 1985).

Soils at Site 2 constitute an alluvial sequence predominated by fine grained overbank deposits with occasional discontinuous sand and gravel channel deposits forming permeable zones. This sequence is typical of valley sediments deposited at the base of the Sierra Nevada foothills. Although coarser sand and gravel beds were encountered in this and previous studies, these stream channel deposits are not as common as the much finer-grained overbank and flood plain deposits that predominate.

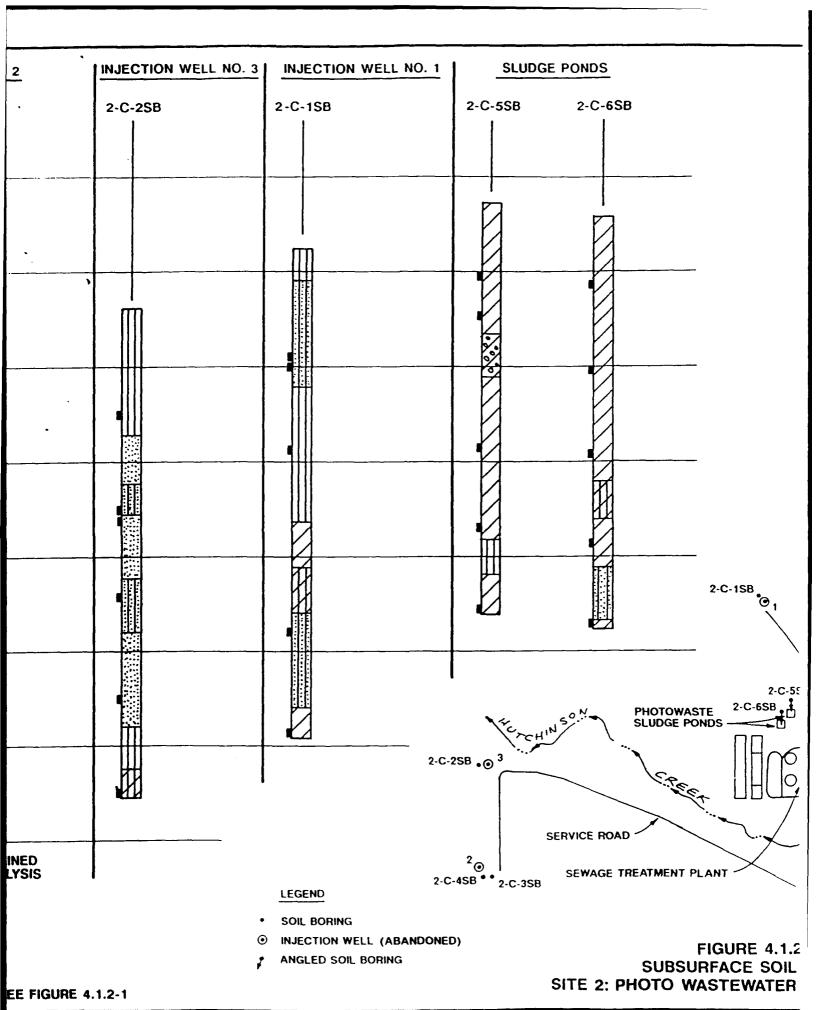
Because stream channels constantly shift their positions through geologic time, the resulting alluvial deposits are characterized by extreme heterogeneity of particle size and distribution such that hydraulic properties are also highly variable. The meandering stream depositional environment produces relatively thin, laterally discontinuous channel deposits. Channel deposits of coarse-grained materials, which are narrow in cross section, may be continuous for long distances in the direction of stream flow. However, these pathways may not be correlatable on geologic cross-sections constructed from logs of soil borings.

Near-surface deposits at Site 2 have been mapped as Victor Formation, except for Quaternary River Deposits along Hutchinson Creek (Page, 1980). The Quaternary River Deposits are the youngest in the area, and represent the most recent alluvial deposition as Hutchinson Creek has meandered across the valley. Victor Formation deposits are an alluvial sequence deposited in Pleistocene time. These deposits overlie the older alluvial Laguna Formation deposits, which in turn overlie sediments of volcanic origin. The contact between the Victor and Laguna Formations is not readily identified in the field. No borehole at Site 2 encountered volcanic materials.

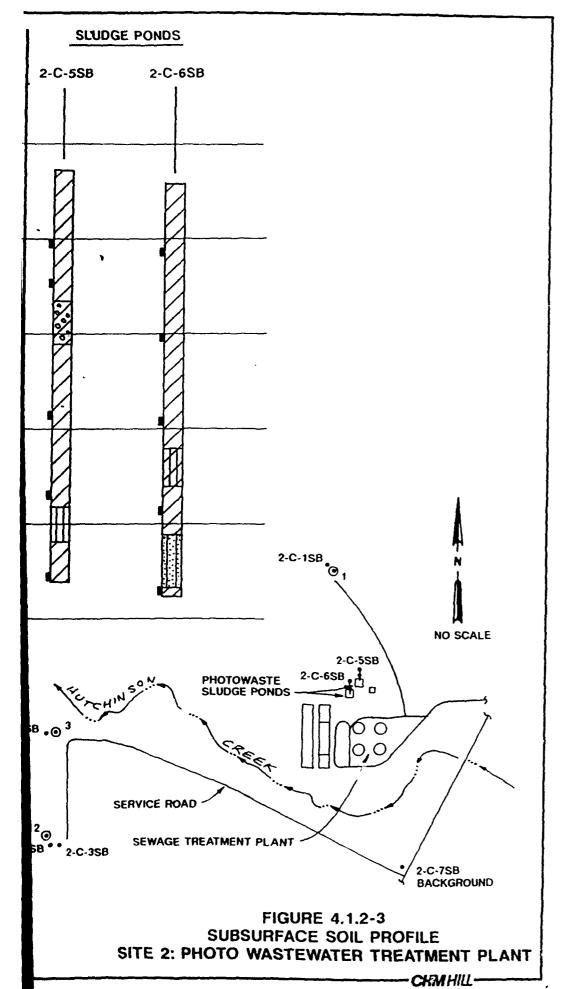


SCALE: HORIZ - NOT TO SCALE 1"= 10' VERT

NOTE: FOR BORING LOCATIONS SEE FIGURE 4.1.2-1



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4.1.2.1.2 Site Hydrogeology

The first saturated permeable zone in well 2-C-1 (constructed near abandoned Injection Well No. 2) that produced water during drilling occurred at a depth of about 92 feet (-9 feet NGVD). This zone comprises a silty sand and well-graded sand which is overlain by a layer of fat clay. Water stabilized in the hole at about sea level, and may be partially confined. As drilling continued, water was produced at depths of 116 to 112 feet (-33 to -29 feet NGVD); 139 to 142 feet (-56 to -59 feet NGVD); and 157 to 170 feet (-74 to -87 feet NGVD--the bottom of the hole). The well was screened at a depth of 145 to 165 feet (-62 to -82 feet NGVD), and water rose in the well to an elevation of about -2.5 feet NGVD.

Wells previously constructed near the sludge ponds (wells 2-R-1, -2, -3, and, -4) were screened across the water table in fine-grained clays with thin interbeds of sandy clay. Groundwater may have been partially confined, with water levels rising from 2 to 7 feet in the hole after drilling contact with permeable sediments (Radian, 1985).

Groundwater levels in the deep monitoring well between abandoned Injection Wells No. 2 and 3 (Figure 4.1.2-1) have been monitored by Beale AFB since 1984. Figure 4.1.2-4 plots groundwater fluctuations in this well, which is 364 feet deep (-279 feet NGVD), and screened at intervals of 132 to 172 feet (-47 to -87 feet NGVD), 192 to 232 feet (-107 to -147 feet NGVD), and 310 to 352 feet (-225 to -267 feet NGVD). As Figure 4.1.2-4 shows, water levels in this well vary as much as 30 feet a year, presumably in response to the seasonal recharge and the demands of agricultural wells. A gradual rise in average annual water levels between 1984 and 1989 may also be observed in Figure 4.1.2-4.

Groundwater levels in other Site 2 monitoring wells are summarized in Table 4.1.2-1 and Figures 4.1.2-5 and 4.1.2-6. This table shows that groundwater in this vicinity has been rising at least since 1986. In well 2-A-1 between April 1986 and November 1989, for example, the groundwater level rose about 20 feet as shown on the hydrograph. Groundwater levels in the Radian installed wells near the sludge ponds rose from 5 to 7 feet during this same time period. The rise in these wells and the deep monitoring well is part of a regional water level rise noticed in other wells on the west side of Beale AFB. Seasonal fluctuations in Site 2 wells during 1989 were only observed in wells 2-A-1 and 2-C-1. Water levels in these wells declined slightly during the summer, possibly in response to nearby agricultural pumping.

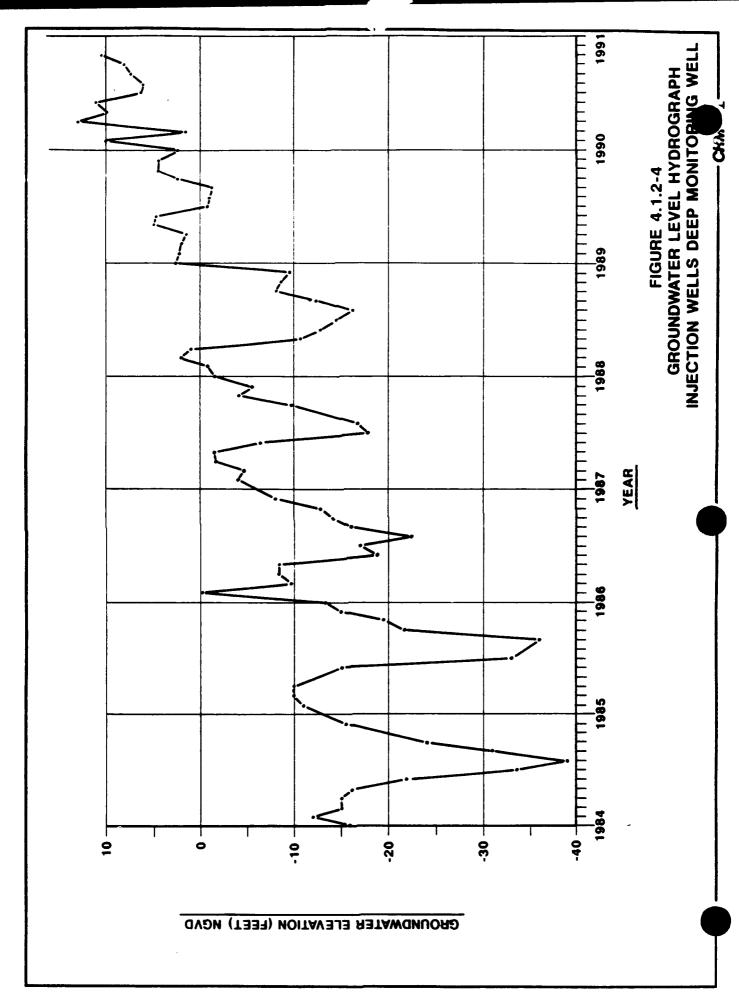
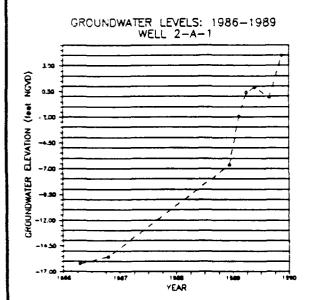
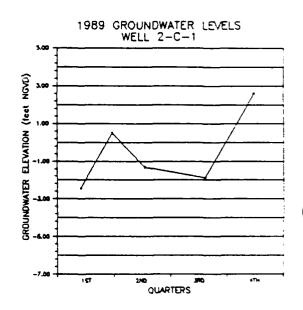


Table 4.1.2-1
GROUNDWATER ELEVATIONS: SITES 2 AND 13
(FEET NGVD)

Well_	Screened Interval	Ap.11 1986	October 1986	December	February 1989	March 1989	May 1989	August	November
2-A-1	-9 to -29	-16.22	-15.57	-6.67	-1.93	0.40	0.91	-0.08	3.96
2-C-1	-62 to -82				-2.43	-0.48	-1.32	-1.88	2.60
2-R-1	13 to -7	5.71		7.68	8.83	9.65	11.36	12.31	13.25
2-R-2	17 to -3	7.05	9.05	8.70	9.03	9.82	11.52	12.48	13.38
2-R-3	15 to 5	10.44	12.27	10.71	11.21	11.85	13.53	14.57	15.36
2-R-4	14 to -6	7.83	9.62	8.86	9.62	10.50	12.30	13.23	14.11
13-A-1	8 to -12	7.15	8.20	7.10	7.49	8.01	10.27	10.42	10.71
13-A-2	14 to -6	1.15	3.16	4.77	6.21	7.38	9.06	9.43	10.60
13-C-1	-7 to -27				2.90	3.78	5.28	6.16	7.87
13-C-2	-39 to -59			· ·	-1.57	0.26	1.00	0.49	3.59
13-C-3	l to -19				5.61	6.81	8.35	8.77	10.03
13-C-4	8 to -12	•-			6.14	7.36	8.91	9.29	10.51
13-C-5	0 to -20				7.77	8.93	10.64	11.25	12.35
13-C-6	4 to -16								0.76



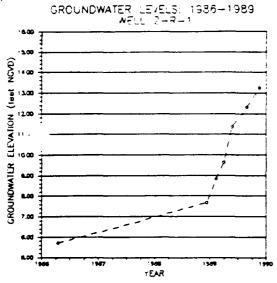


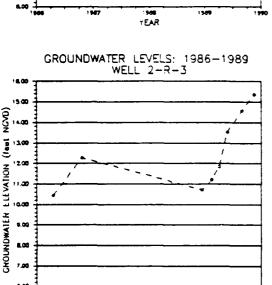
NOTE: VARYING TIME SCALES

FIGURE 4.1.2-5

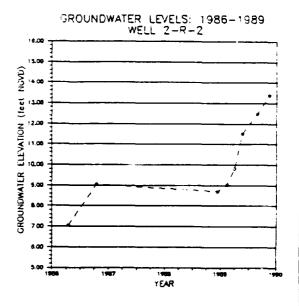
MONITORING WELL HYDROGRAPH
SITE 2: PHOTO WASTEWATER TREATMENT PLANT

CHM HILL-





YEAR



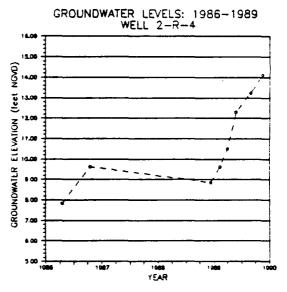


FIGURE 4.1.2-6

MONITORING WELL HYDROGRAPH
SITE 2: PHOTO WASTEWATER TREATMEN : PLANT

Groundwater levels from Site 2 (and Site 13) monitoring wells in May 1989 are plotted on Figure 4.1.2-7. This figure and Table 4.1.2-1 show that there is a vertical component of flow downward in paired we'ls 2-A-1 and 2-C-1, corresponding to a downward gradient in paired wells 13-C-2 and 13-C-3. Groundwater contours may not be drawn with confidence on the data in Figure 4.1.2-5, because the wells are screened at different intervals. Hence, the levels may be affected by vertical gradients. In general, wells that are screened at a deeper interval show a lower groundwater elevation at Sites 2 and 13. This may be due to these wells' location in a zone of recharge and to head losses across zones of lower permeability.

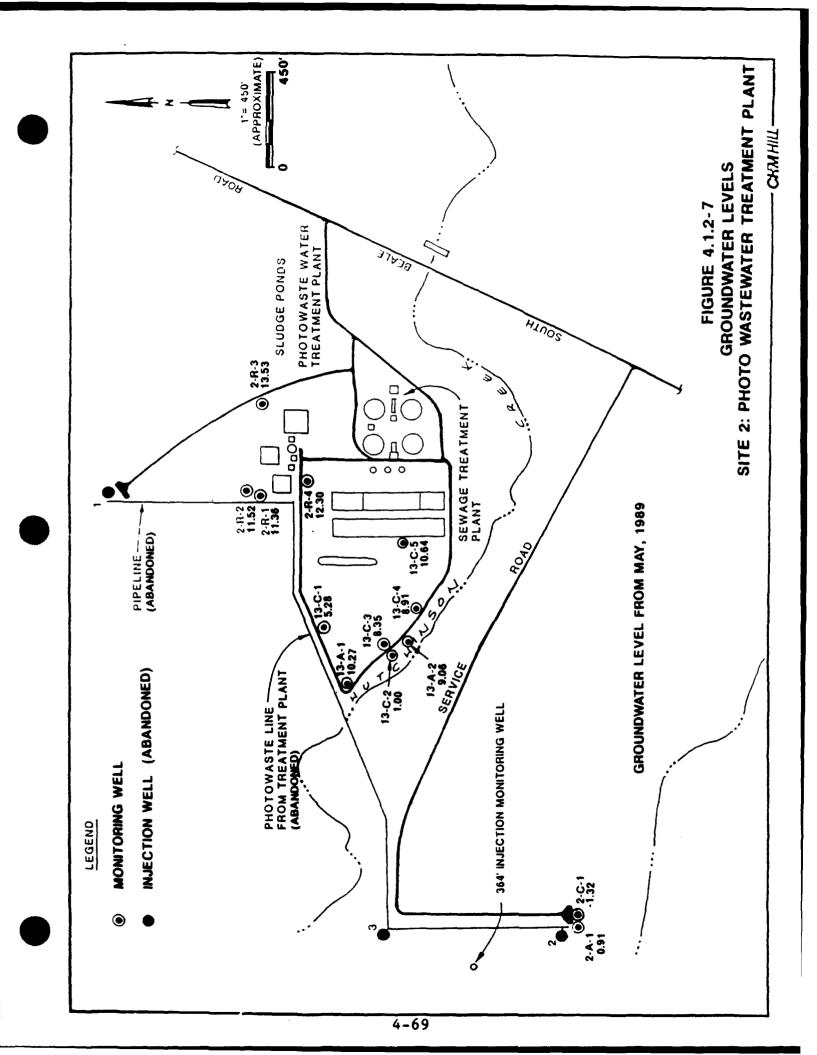
Plates 3 and 4 plot groundwater level contours based on elevations measured in March and November 1989 at Beale AFB. These plates show that in the vicinity of Site 2, groundwater is flowing to the northwest, under the influence of the groundwater depression west of the base. The horizontal gradient near Site 2 is about 20 feet per 3,000 feet, or 0.007.

Estimates of aquifer parameters for the deeper aquifer zone screened by well 2-C-1 were derived according to the Cooper-Jacob Method (1946) from the water level drawdown and recovery data generated during a 4-1/2-hour pump test of well 2-C-1 in which this well was pumped at a constant rate of 14.8 gpm. Plots of the data and a discussion of testing methodology are provided in Appendix E. Both the drawdown and recovery portion of the test yielded values of transmissivity of 7,800 gallons per day per foot, or 1,000 square feet per day and a hydraulic conductivity of 52 feet per day (0.018 cm/sec). No water level change was observed in well 2-A-1 (the shallow well paired with 2-C-1) during this test.

No aquifer tests were performed on the existing monitoring wells at the photo waste sludge ponds during the Stage 2-1 study. Pump tests performed on Site 13 wells provide an indication of aquifer parameters in the vicinity of Site 2. A discussion of these tests is included in Section 4.1.13.1.2.

4.1.2.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results which are indicators of site-specific contamination. Not all analytes are



individually discussed or illustrated, but all detected analytes are presented in the Analytical Results table in Section 4.1.2.1.4 and in Appendix A.

Sludge Ponds and Surface Soils

Three photo waste sludge pond sediment samples were taken from each of the two unlined sludge ponds at Site 2 (Figure 4.1.2-8). Eight surface soil samples were taken from suspected spill areas near the photo wastewater treatment plant.

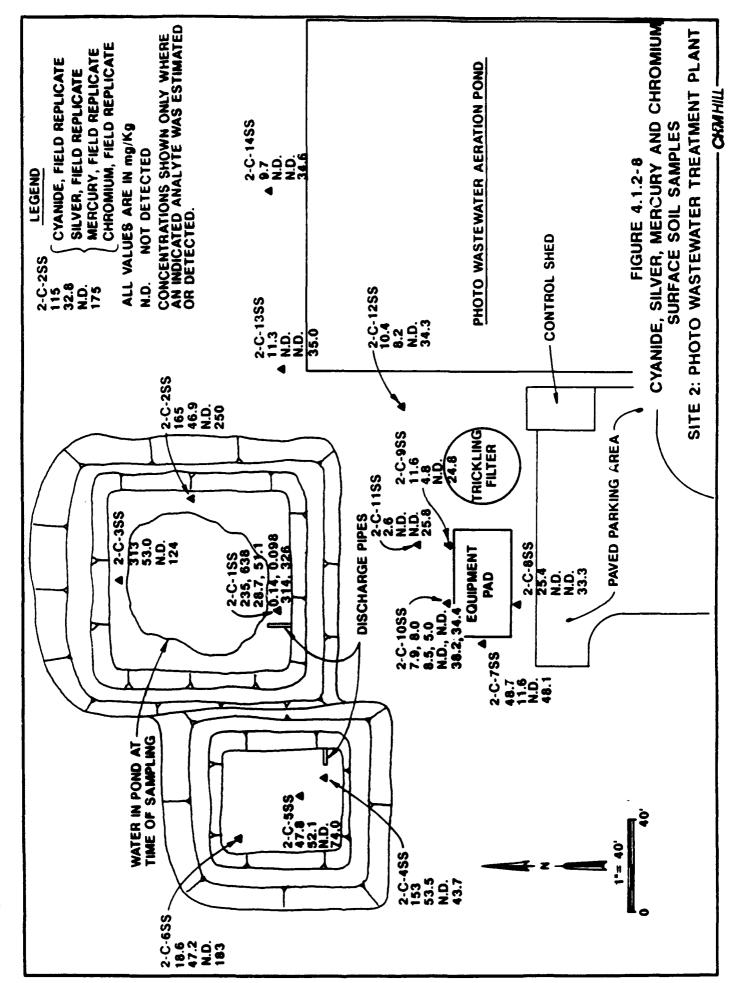
These sludge pond sediment and surface soil samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), cyanide (9010), soil moisture (ASTM D2216), and TFH-gas and diesel (California method). One sludge sample was also analyzed for dioxins and furans.

The only volatile or semivolatile organic chemical detected in the sludge pond sediment or surface soil samples was toluene which was detected in 9 of 14 samples up to 1.1 mg/kg. However, only five of the nine detections were above the LOQ, four were "J" values below the LOQ. Silver was detected in the six sludge pond sediment samples at concentrations from 28.7 to 53.5 mg/kg (Figure 4.1.2-8). Lead was detected in surface soil sample 2-C-7SS at 151 mg/kg. Mercury was detected in sludge pond sediment sample 2-C-1SS at 0.14 mg/kg. Cyanide was detected in all six sludge pond sediment samples from 18.6 to 638 mg/kg and in all eight surface soil samples from 2.6 to 48.7 mg/kg (Figure 4.1.2-8). Chromium was detected in all six sludge pond sediment samples from 43.7 to 326 mg/kg and in all eight surface soil samples from 24.8 to 48.1 mg/kg. The average value of chromium in background soil samples was 31 mg/kg; 46 mg/kg is two standard deviations above the average background level.

Sludge pond sediment sample 2-C-6SS was analyzed for dioxins and furans. Tetra dioxins were 0.0017 mg/kg (1.7 ug/kg), penta dioxins 0.019 mg/kg (19 ug/kg), hexa dioxins 0.076 mg/kg (76 ug/kg), hepta dioxins 0.58 mg/kg (580 ug/kg), and octa dioxins were 1.1 mg/kg (1,100 ug/kg). Tetra furans were 0.0013 mg/kg (1.3 ug/kg), penta furans 0.012 mg/kg (12 ug/kg), hexa furans 0.038 mg/kg (38 ug/kg), hepta furans 0.19 mg/kg (190 ug/kg), and octa furans were 0.38 mg/kg (380 ug/kg).

Soil Borings

A total of 39 soil boring samples were collected at Site 2 (Figures 4.1.2-1 and -9): five from each of the two angle



borings (2-C-5SB and -6SS) under the sludge ponds, five samples from the vertical boring (2-C-1SB) at abandoned Injection Well No. 1 and five from the boring (2-C-2SB) at abandoned Injection Well No. 3, five samples from the 25-foot (2-C-4SB) and eight from the 50-foot boring (2-C-3SB) at abandoned Injection Well No. 2, and six from a vertical background boring (2-C-7SB).

Soil boring samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7270/7471), cyanide (9010), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method).

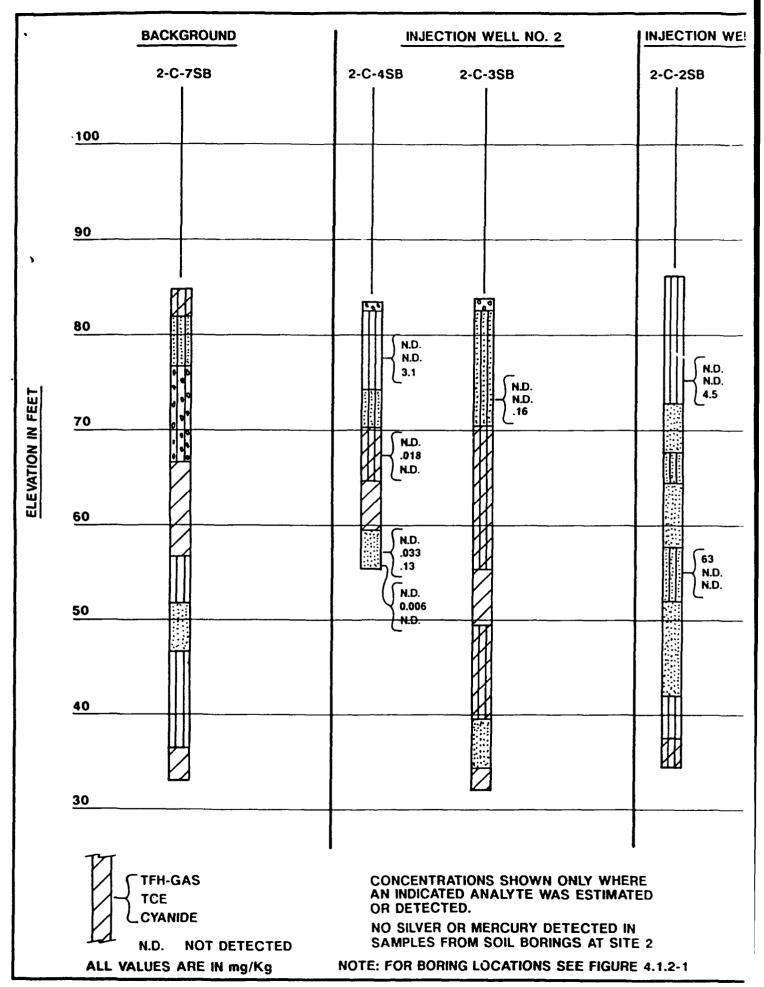
The only volatile organic compounds detected in soil borings were chloroform at 0.013 mg/kg in the 30-foot sample (actual vertical depth equals 26 feet) and benzene at 0.012 mg/kg in the 38-foot sample (actual vertical depth equals 32 feet) in boring 2-C-5SB. Semivolatile organic chemicals were detected in several soil boring samples at Site 2 at levels below the LOQ. Bis(2-ethylhexyl) phthalate was detected in six samples up to 0.13 mg/kg. Di-n-butyl phthalate was detected in four samples up to 0.48 mg/kg; 2-butanone was detected in two samples at 0.041 mg/kg. N-nitrosodiphenylamine was estimated below the LOQ in five samples.

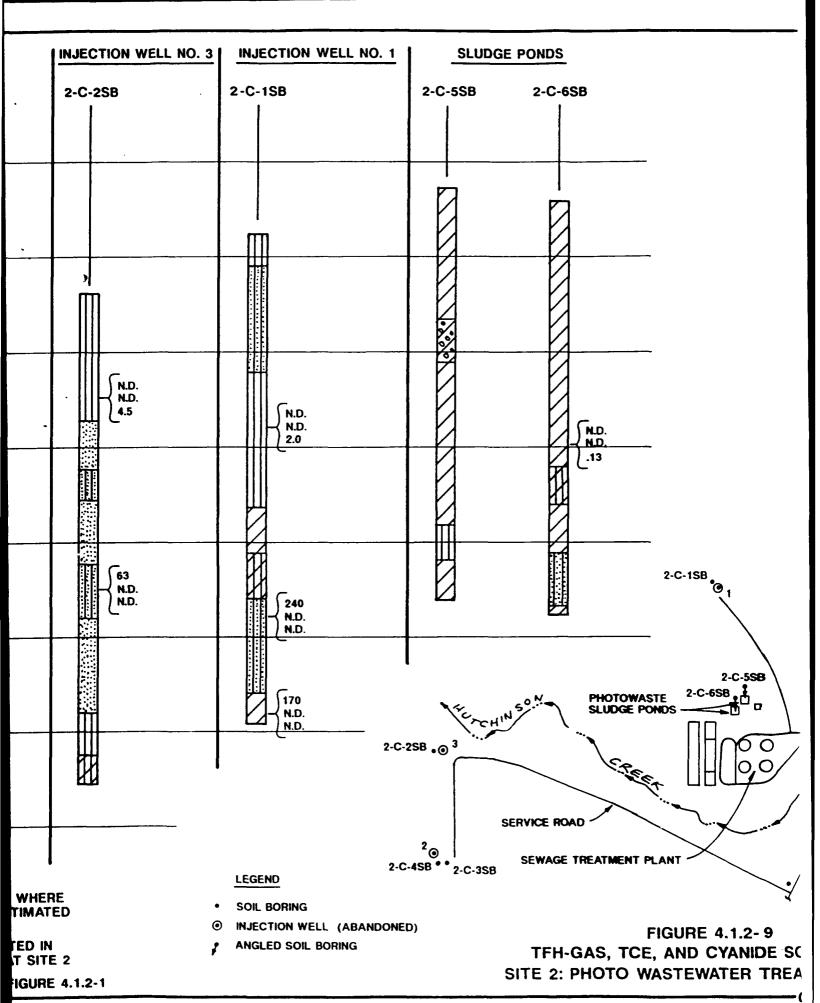
ICP metals were detected in Site 2 soil boring samples at concentrations generally similar to background levels. Silver and mercury were not detected in samples from soil borings at Site 2. Lead was detected in the 30-foot sample in boring 2-C-2SB at 29.4 mg/kg.

TFH-gas was detected in boring 2-C-1SB at 240 mg/kg at 40 feet and 170 mg/kg at 50 feet (Figure 4.1.2-9). TFH-gas was also detected at the 63 mg/kg detection limit at 30 feet in boring 2-C-2SB. Cyanide was detected in six samples up to 4.5 mg/kg (Figure 4.1.2-9).

Groundwater

During the IRP Phase II, Stage 1 investigation (AeroVironment, 1987) groundwater samples were taken in the April and October, 1986 sampling rounds at the PWTP in wells 2-R-1 to 2-R-4 and near abandoned Injection Well No. 2 in monitoring well 2-A-1. Benzene was detected in well 2-R-2 at 0.9 ug/l in both rounds and at 0.3 ug/l in well 2-R-1, which was only sampled in the second round. Toluene was detected at wells-2-R-2, 2-R-3 and 2-R-4 from 0.3 to 0.7 ug/l in the first round but not in the second. The following compounds were detected only in the first round at well 2-R-2: ethylbenzene (0.8 ug/l), chlorobenzene (0.4 ug/l), xylenes (0.4 ug/l), and dichlorobenzenes (1.8 ug/l). Barium ranged





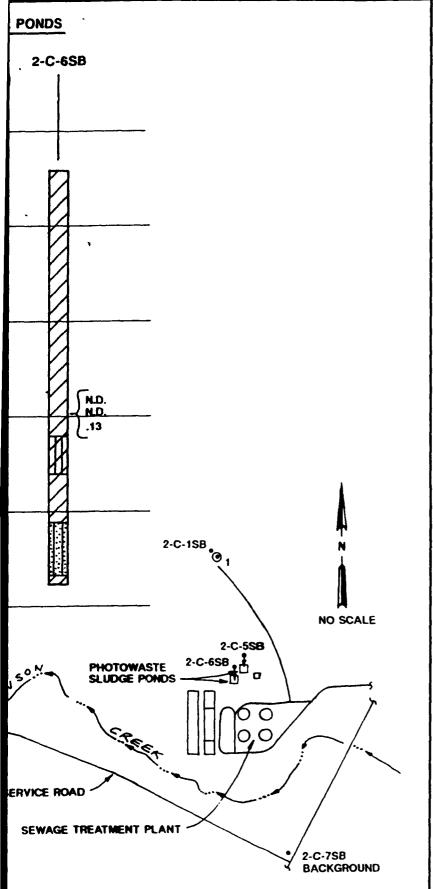


FIGURE 4.1.2-9
TFH-GAS, TCE, AND CYANIDE SOIL SAMPLES
SITE 2: PHOTO WASTEWATER TREATMENT PLANT
CHMHIL

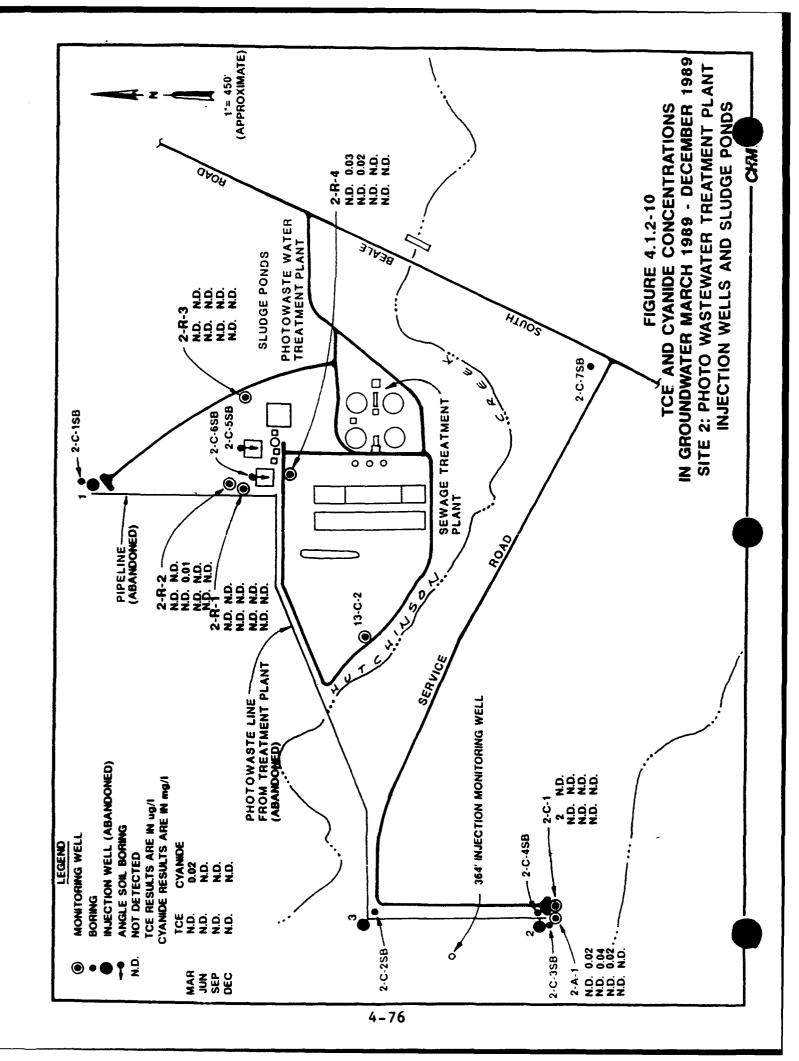
from less than 0.050~mg/l to 0.160~mg/l in the Radian wells. Silver was detected in well 2-R-1 at 0.080~mg/l in the second round. Silver was only detected in the first round in well 2-R-4 at 0.030~mg/l.

During each of the quarterly rounds of Stage 2-1 sampling at Site 2, six groundwater samples were collected: one from each of the four monitoring wells installed by Radian Corp. at the PWTP (2-R-1 to 2-R-4), one from the shallow monitoring well at abandoned Injection Well No. 2 (2-A-1) and one from the new deep monitoring well (2-C-1) at abandoned Injection Well No. 2. The three injection wells were abandoned in November 1989. Analyses performed for water samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7421), mercury (7470/7471), selenium (7740), cyanide (9010) and water quality parameters.

The only volatile organic compounds detected in the first quarterly sampling round of Stage 2-1 (Figure 4.1.2-10) were TCE in well 2-C-1 at 2 ug/l (3 ug/l in the second column confirmation) and toluene at 3 ug/l (3 ug/l in the second column confirmation). Phenol was detected below the 10 ug/l LOQ in 2-R-1. Bis(2-ethylhexyl) phthalate was detected in 2-A-1, 2-R-1, and 2-C-1 below the LOQ of 10 ug/l. Silver was not detected in any samples, with a 0.030 mg/l LOQ. Barium was not detected at Site 2 above a 0.100 mg/l LOQ. Cyanide was detected in well 2-R-4 at 0.0300 mg/l and in well 2-A-1 at 0.0200 mg/l (Figure 4.1.2-10). Arsenic, lead, mercury, selenium, and TFH-gas and -diesel were not detected in groundwater at Site 2.

At the PWTP in the first round, TDS in groundwater ranged from 231 mg/l at well 2-R-4 to 435 mg/l in 2-R-3. Sulfate was highly variable at the PWTP, being detected at 48.8 mg/l in 2-R-1 and 130 mg/l in background well 2-R-3, one of the highest levels measured at Beale AFB. However, sulfate was only 19.7 mg/l in well 2-R-4. Sulfate concentrations at these wells are consistent with those measured during sampling by Beale AFB personnel from 1985 to 1988. Nitrite plus nitrate (expressed as nitrate) ranged from 18.6 to 25.3 mg/l. Groundwater at the PWTP ranges from a magnesium-calcium sulfate to a magnesium-calcium bicarbonate type.

Groundwater in the monitoring wells at abandoned Injection Well No. 2 had 216 mg/l TDS in shallow well 2-A-1 and 192 mg/l in deep well 2-C-1. Nitrate was 16.5 mg/l in both wells. Sulfate concentrations were lower than at the PWTP with 30.5 mg/l in 2-A-1 and 12.7 mg/l in 2-C-1. Other major anions and cations were similar to levels measured throughout Beale AFB. Groundwater is magnesium-calcium bicarbonate in 2-A-1 and calcium-magnesium bicarbonate in 2-C-1.



The only volatile organic compound detected in the second sampling round was toluene at 3 ug/l (2 ug/l in second column) in shallow well 2-A-1. Toluene was detected in 2-R-2 at 3 ug/l but was not confirmed in the second column. In 2-R-4, toluene was detected at 38 ug/l (13 ug/l in second column).

Phenol was detected at 14 ug/l at well 2-R-1. Arsenic, lead, mercury, and selenium were not detected in any wells. Cyanide was detected in well 2-A-1 at 0.0400~mg/l, in well 2-R-2 at 0.0100~mg/l, and in well 2-R-4 at 0.0200~mg/l. Water quality parameters and types were similar to the first round results.

The only volatile organic compound detected in the third sampling round was toluene at shallow well 2-A-1 at 1 ug/1. Methylene chloride (13 ug/1) and toluene (2 ug/1) were detected and confirmed in the second column in an equipment wash blank for 2-R-4 and methylene chloride at 4,700 ug/l in the ambient condition blank, but this is judged to be due to contaminated reagent grade distilled water as these compounds were not detected in the original sample or the field duplicate. Phenol was detected at 22 ug/l in 2-R-1. Arsenic, mercury, lead, selenium, and cyanide were not detected in any wells. Water quality parameters and types were similar to the first round results.

No volatile organic compounds, TFH-gas or diesel, were detected at Site 2 in the fourth sampling round. Arsenic, mercury, lead, selenium, and cyanide were not detected. Phenol was not detected. Water quality parameters and types were similar to the first round results. Nitrate ranged from 16.8 to 29.5 mg/l. Sulfate remained high at 143 mg/l at well 2-R-3.

4.1.2.1.4 Analytical Results Table

Table 4.1.2-2 presents a summary of all detected analytes for Site 2. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.2-2 are generally the lowest federal and state levels applicable to the sampled media (soil and groundwater). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.2.1.5 Discussion of Analytical Data

Samples of the photo waste sludge contained several potential contaminants including cyanide, silver, chromium, and dioxins/furans. Some of these contaminants were detected in surface soil samples from suspected spill areas, but contaminants were not consistently detected in either soil

TABLE 4.1.2-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 2

				Standards, and Action	Eriteria Levels (a)	2-C-15S	2-C-188	2-C-255 BAFB-0059	8AFB-0060	BAFB-0061	BAFB-0062
Parameter	Method	Detection Limit	Units	Federal	State	0.0-1.0' 11/22/88	0.0-1.0 11/22/88	0.0-1.0 11/22/88	0.0-1.0' 11/22/88		
	ACAMO	V/N	×	S	SI	33.7	28.8	30.1		:	21.3
	1747un	5	-0/kg	S 38	202	0,14	0.098	2			욮
	010075	0,10	o/ko	S	SE	235	638	165			8.74
	S16010	20.0	mo/ko	SE	SE	34400	29100	17900	26800	15400	15500
	S16010	10.0	mo/ka	SE	10,000	123	110	136 136			137
	Succession	6	pa/ka	S	5	2.0	2.0	2.7			욯
	SUKOTO	001	2/kg	SH	SE	2170	1780	2190			1500
	010342	C .	0/10	SE	200	314	326	250			74.0
	010348	6.0	o/ko	SE	8,000	35.1	22.5	4.9			35.6
ניסטינ	S146010	3.0	o/ko	S	2,500	41.5	38.8	42.2			35.2
	Succession of the succession o	10.0	0/kg	S	S#	27600	25000	22200			25300
Magaza	SUK010	0	0/kg	SE	SX.	2560	2390	2580			2480
	01030		0/10	S	S	1130	35.	130			962
	OLOSALS OLOSALS	. 4	0//0	S	2,000	19.6	15.4	13.2			16.5
	010348	200	o/ka	S	SE	1010	955	1670			3
	SLK010	0.8	mo/ka	SH	200	28.7	51.1	6.97			52.1
	Su6010	9	mo/kg	SE	SX.	32	ĸ	868			3
Venedium	Su6010	7	mo/kg	SE	2,400	89.1	83.4	7.2.			91.1
7 inc	SW6010	2.0	mo/ko	SE	2,000	92.9	9.97	6.94			8 39.3
Methylene Chloride	SUB240	0.002	mo/ko	SE	SE	0.98 E	0.69	BJ 0.69	2	.	8 0.94
Acetone	SH8240	0.010	mo/kg	SE	SX	1.7 J	1.7	2			0.97
Tolinge	070	0.005	a/ka	SE	SE	0.48	8.0	2			2
100040	CCM270	0.33	o/ko	S	SE	3.3	3.1	8 2.7	80	8	8 2.3

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

e: equipment wash blank f: field replicate R: resample

MI: analyte not tested

Williams tested

Williams the standard criteria or action level currently exists.

Williams tisted in () are 2nd column confirmation values.

Williams tisted in () are 2nd column confirmation values.

Williams represent most stringent standard, criteria or action level. See Appendix I.

The faderal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

Parameter	Method	Detection Limit	Units	Standards, and Action Federal	Criteria Levels (a)	2-C-6SS BAFB-0063 0.0-1.0' 11/22/88	2-C-7SS BAFB-0064 C.0-1.0 ⁴ 11/22/88	2-C-8SS BAFB-0065 0.0-1.01 11/22/88	2-C-9SS BAFB-0066 0.0-1.0* 11/22/88	2-C-10SS BAFB-0067 0.0-1.0' 11/22/88	2-C-10SS' BAFB-0068 0.0-1.0' 11/22/88
Percent Moisture	ASARO	W/N	><	SN	S¥	17.6	71	19.4	18.1	17.3	17.8
Conide	SLOOTO	01.0	mo/ko	S	S	18.6	7.87	25.4	11.6	0.2	8.0
	S146010	20.0	ma/ka	S	SZ	32800	11200	13500	7830	9190	9260
	S46010	10.0	mo/ka	S	10.000	119	77.9	96.3	62.9	125	94.2
	SW6010	1.0	mo/ko	SR	100	윺	2	2	1.6	2	2
Calcium	S46010	100	mo/kg	SE	SE	1600	2210	4230	2700	2760	2750
Chromium	SW6010	3.0	mg/kg	SN	200	183	48.1	33.3	24.8	38.2	7.78
Cobelt	SW6010	4.0	mo/kg	SE	8,000	12.1	15.1	21.1	17.1	27.4	15.8
CODE	Su6010	3.0	mo/kg	SE	2,500	40.7	43.4	39.1	25.9	27.1	26.3
[Tan	SW6010	10.0	mo/kg	SR	SR	22800	37300	24400	17600	19200	19600
Lead	SW6010	20.0	Mo/kg	SE	1,000	2	151	2	2	9	욮
Magnesium	SW6010	9	mg/kg	SE	SE	2350	2150	3100	2640	2560	2470
Manganese	Sw6010	1.5	mg/kg	SN	SN	592	725		571	1150	727
Bickel	SW6010	4.0	MG/kg	SN	2,000	11.7	16.3		14.7	21.8	15.8
Potassica	SW6010	200	MQ/kg	SN	SR	1210	581		077	967	247
Silver	SW6010	3.0	MG/kg	SE	200	47.2	11.6		8.4	8.5	5.0
Sodium	SW6010	1 00	mg/kg	SN	SN	551	336		5 67	317	327
Theilien	SW6010	20.0	mg/kg	SH	8	2	33.6	_	2	2	윺
Vanadium	SW6010	4.0	₩0/kg	NS	2,430	9.0	57.6		52.7	58.6	57.7
Zinc	Sw6010	2.0	Mg/kg	NS	2,000	53.5	131	43.4	53.4	57.6	59.7
Hethylene Chloride	SW8240	0.005	Mg/kg	SN	SH	1.0	90.004	2	B J 0.010	B 0.004	BJ L8
Toluene	SW8240	0.005	mg/kg	SM	SH	2	0.013		0.026	2	욮
Phenol	SW8270	0.33	MO/kg	SH	SN.	2.2	3 2.2	•	B 2.3	8 2.4	8 2.4
bis(2-ethylhexyl)phthalate	SW8270	0.33	Mg/kg	SE	SZ	9	2		2	₽	0.83
Tetra Furans (total)	SW8280	0.00001	mg/kg	NS	SX	0.001	F8	E	F	LX.	IN
Penta Furans (total)	SW8280	0.00001	MO/kg	SN	SH	0.012	Ħ	Ħ	H	12	H
Hexa Furans (total)	SW8280	0.00001	Mo/kg	SN	SE	0.038	H	Ħ	H	H	H
Hepta Furans (total)	SW6280	0.00001	m /kg	SN	SZ	0.19	H		×	Ħ	T#
Octa furans (total)	SW6280	0.00001	mg/kg	SE	SN	0.38	12	Ħ	12	Ħ	H
Tetra Dioxins (total)	SH8280	0.00001	Mg/kg	SH	5	0.001	Z	*	T.	T.M.	F
Penta Dioxins (total)	SW8280	0.00001	20/kg	SZ	SE	0.019	H	Ħ	H	X	H
Hexa Dioxins (total)	SW8280	0.00001	Mg/kg	SH	SH	0.076	H	7	H	H	T.
Mepta Dioxins (total)	SW8280	0.00001	mo/kg	SN	SE	0.58	Ħ		H	I	H
Orta Dioxine (total)	Su8280	0.00001	MO/kg	SH	SE	=	Ħ	×		Ħ	

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) WOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

		•		Standards, C and Action L	Criteria Levels (a)	2-C-11SS BAFB-0069	2-C-11SSR BAFB-0349	2-C-12SS BAFB-0070	2-C-1255R	2-C-13SS BAFB-0071	2-C-1355R BAFB-0351
Parameter	Method	Detection Limit	Units	Federal	State	0.0-1.0' 11/22/88	0.0-1.0 12/21/88	11/22/88			
Percent Moisture	ASA#9	V/N	*	SE	RS	16.4	=	8.5	T	13.1	
Cyanide	Str9010	0.10	mo/kg	SH	SH	5.6	H	10.4	H	11.3	=
Atominon	Su6 010	20.0	mg/kg	SE	SE	929	H	11500	×	11600	H
Berica	S 46010	10.0	mo/kg	SH	10,000	56.9	H	86.3	Ħ	7.86	H
Calcium	Su6010	5	mo/kg	SN	SN	2130	H	3140	H	2780	=
Chromica	S46010	3.0	mo/kg	SE	200	25.8	H	34.3	H	35.0	H
Cobelt	Sta6010	6.0	mg/kg	SE	8,000	12.0	Ħ	20.8	Ħ	25.8	
Copper	Su6010	3.0	mo/kg	SN	2,500	19.1	Ħ	30.4	Ħ	28.5	
5	Su6010	10.0	m/kg	SE	SE	14000	H	23000	¥	22400	Ħ
Megnesium	Su6010	5	Mo/kg	SE	SZ	2210	Ħ	3090	Ħ	1860	Ħ
Nanganese	S 46010	1.5	M/kg	SH	SE	22	H	202	Ħ	1010	Ħ
Nickel	S46010	0.4	mo/kg	SM	2,000	14.4	H	17.5	Ħ	15.0	
Potassica	Su6010	200	MQ/kg	S	SZ	335	×	626	H	53	IN
Silver	Su6010	3.0	MQ/kg	SH	200	2	H	8.2	Ħ	윺	H
Sodium	Su6010	5	MO/kg	SE	SN	159	Ħ	258	Ħ	171	
Vanadius	Su6010	4.0	ma/kg	SE	2,400	70.6	Ħ	20.1	H	73.9	H
2 inc	Su6010	2.0	M/kg	SR	2,000	33.5	H	40.5	H	32.9	H
Toluene	SM8240	0.002	mo/kg	SH	SE	H	0.28	THE T	0.55	- N	0.36
Phenol	Su6270	0.33	ma/ko	SI	SH	2.5	H	2.2	B M	2.0	B MT

NOTES: Results reported for detected analytes only.

MI: analyte not tested
MI: analyte not detected.
MI: analyte not detected in blank
MI: analyte not detected.
MI: analyte n

e: equipment wash blank f: field replicate R: resample

TABLE 4.1.2-2 (continued)

				Standards,	Criteria Levels (a)	2-C-14SS BAFR-0072	2-C-14SS ^R 8AF8-0352	-	2-C-158 ^f 8AFB-0097		
Parameter	Method	Detection Limit	Units		State	11/22/88	0.0-1.0	10.0-11.5	11.5-13.0	20.0-21.5	30.0-31.5
Percent Moisture	ASA#9	W/A	×	SN	SN	14.7	F	18.2	19.4	20.7	3.1
Cvanide	Sur9010	0.10	mo/kg	SH	SE	7.6	H	욡	9	2.0	2
Atumina	SW6010	20.0	mg/kg	SN	SE	13100		12200	12500	15100	23000
Berica	SW6010	10.0	mo/kg	SN	10,000	127	H	58.3	170	158	115
Calcium	S46010	5	mo/kg	SN	SR	3330	*	3920	4330	5550	5780
Chromium	SW6010	3.0	mo/kg	SE	200	34.6	T.R.	¥.6	40.2	49.1	31.5
Cobalt	SW6010	0.4	mo/kg	SE	8,000	22.3	H	13.4	26.2	20.2	17.4
Copper	SW6010	3.0	mo/ko	SE	2,500	30.0	¥	48.3	67.5	49.2	59.3
Lon	SW6010	10.0	mo/kg	SE	SH	25200	H	29600	46300	27100	39300
Keanesius	SW6010	2	an/ka	SE	N	3280	Ħ	5950	7360	7180	2340
Hananese	Sw6010	1.5	mo/kg	SE	SH	882	H	262	1340	836	845
Rickel	SW6010	4.0	mo/kg	SE	2,000	16.4	-	19.6	27.0	28.9	30.7
Potessius	SW6010	200	mg/kg	SN	SH	697	¥	1340	385	832	1110
Sodium	SW6010	5	ma/kg	SN	SN	134	×	28	326	&	563
That Lice	SW6010	50.0	mg/kg	SN	2	9	H	63.1	67.7	유	131
Vanadium	SW6010	0.4	MQ/kg	SE	2,400	o.	7	91.0	159	60.3	89.5
Zinc	SW6010	2.0	mg/kg	SN	2,000	38.5	H	57.7	72.7	61.9	80.1
Methylene Chloride	SW8240	0.002	mg/kg	SN	SN		2	0.022	B 0.024	B 0.030	B 0.033
Toluene	SW8240	0.005	mg/kg	SN	SN	H	0.3¢	J 0.10	0.046	0.11	0.16
Phenol	SW6270	0.33	MQ/kg	W	SH	2.2 ₽	T.N.	2	2	2	웆
N-nitrosodiphenylamine	SW8270	0.33	MO/kg	SN	SH	2	H	2	0.047	2	욮
Di-n-butylphthelate	SH8270	0.33	mg/kg	SN	SN	2	H	0.15	BJ 0.088	B J 0.20	BJ 0.19 I
Di-n-octyl phthalate	SW8270	0.33	Mg/kg	MS	SE	0.28	H	9	2	욮	£

e: equipment wash blank f: field replicate R: resample MOTES: Results reported for detected analytes only.

MI: analyte not tested

MO: analyte not detacted.

MO: detact

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. for Mitrate + Mitrite given as Mitrate.

TABLE 4.1.2-2 (continued)

Parameter	Method	Detection Limit	Units	Standards, and Action Federal	Criteria Levels (a) State	2-C-1SB BAFB-0100 40.0-41.51 12/05/88	2-C-1SB BAFB-0101 50.0-51.51 12/05/88	2-C-2SB BAFB-0102 10.0-11.5	2-C-2SB BAFB-0103 20.0-21.5' 12/05/88	2-C-258 ^f BAFB-0104 21.5-23.0 ¹ 12/05/88	2-C-2SB BAFB-0105 30.0-31.5 ¹ 12/05/88
Percent Moisture	ASA49	N/N	×	S#	Ş	18.2	31.3	19.2	18.7	19.3	20.4
Cyanide	SW9010	0.10	mg/kg	S¥	SH	æ	2	4.5	9	2	2
1FH-G88	75-ET	20	mg/kg	SI	SE	240	13	2	⊋	욮	3
Atuminum	Su6010	20.0	mg/kg	SH	SH	16100	21800	17200	13900	14300	35200
Barium	St.6010	10.0	MO/Kg	WS	10,000	43.3	147	125	89.1	147	202
Calcium	SW6010	5	MQ/kg	SN	SR	0067	7,960	4520	3060	3430	5250
Chromium	Sta6010	3.0	mg/kg	SN	200	% .2	8.62	43.3	26.8	26.3	47.1
Cobalt	SIM6010	4.0	mg/kg	SM	8,000	15.9	14.6	25.7	11.7	13.6	20.1
Copper	Sta6010	3.0	MO/kg	SN	2,500	56.7	52.0	58.8	31.7	37.3	61.8
Iron	SW6010	10.0	mg/kg	SH	SE	37900	30000	35500	27100	26900	42100
peel	Su6010	20.0	MQ/kg	SN	,000	2	9	2	욮	9	7.62
Negner i un	Sta6010	5	MQ/kg	S	SE	0299	5970	6930	4020	4210	0689
Manganese	Sta6010	1.5	mg/kg	SE	SE	413	820	273	300	855	510
Nickel	St#6010	4.0	mg/kg	SH SH	2,000	20.8	¥	28.1	22.1	25.4	51.3
Potassium	Succ 10	00	mg/kg	SE	S#	875	878	322	603	719	1760
Sodium	SW6010	<u>\$</u>	mg/kg	SE	SH	210	450	220	526	245	288
Thellium	Stu6010	20.0	m 0/kg	SE	8	3.°	 	욡	82.4	87.6	5
Veradium	Sta6010	6.0	2 /kg	SE	2,400	101	59.0	8.5	59.4	58.1	84.2
2 inc	SW6010	2.0	mg/kg	SH	2,000	4.98	74.8	\$.5	7.67	54.3	7.06
Hethylene Chloride	SM8240	0.002	** 0/kg	MS	SH	0.033 6	0.052	920.0	B 0.049	B 0.032	B 0.045 B
Acetone	SM8240	0.010	20/kg	S	SE	윺	2	0.10	0.16	0.19	90.0
Toluene	SM8240	0.005	20/kg	SH	SZ	0.13	0.10	0.007	0.024	0.027	0.082
Di-n-butyiphthelete	Su6270	0.33	mg/kg	SE	SH	0.087	1 0.31	3J 0.12	BJ 0.26	BJ 0.12	BJ 0.41 B

NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

ND: detected in blank

ND: field blank (ambient condition blank)

RD: resample

ND: values listed in () are 2nd column confirmation values.

ND: values represent most stringent standard, criteria or action level. See Appendix I.

ND: Ine federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

				Standards, and Action	Criteria Levels (a)	2-C-2SB BAFB-0109	2-C-25B BAFB-0110	2-C-3SB BAFB-0114	2-C-3SB BAFB-0115	2-C-3SB' BAFB-0116	2-C-3SB BAFB-0117
er anet er	Method	Detection Limit	Units	Federal	State	40.0-41.5 12/06/88	50.0-51.5 12/06/88	5.0-6.5	10.0-11.5 12/07/88	11.5-13.0° 12/07/88	15.0-16.5 12/07/88
Percent Moisture	ASARP	N/A	**	SE	SH	20.8	61	13.4			28.8
Vanide	Sup010	0.10	mo/kg	X.	SH	2	2	2			2
Luiru	State 010	20.0	Mo/kg	SE	SH	12400	15900	6630	9010	8420	21600
Barica	510010	10.0	mg/kg	SR	10,000	107	167	39.5			153
•lci.	Stu6010	<u>5</u>	B4/0m	SH	SE	3430	5250	2550			3650
hromium	Su6010	3.0	10/kg	SH	200	31.1	38.9	21.9		_	3 53.5
obalt	Su6010	4.0	mo/kg	SX	8,000	15.2	18.5	8.9			12.2
obber	Stu6.010	3.0	MQ/kg	SH	2,500	41.0	49.3	24.0			49.7
5	Stu6010	10.0	MQ/kg	SN	SE	25800	27700	15000		_	31300
egnesium	SW6010	5	MQ/kg	SE	SI	5130	7520	2680			5800
anganese	SIM6010	1.5	20/kg	SN	SH	298	26	196			617
icket	Stu6010	4.0	MO/kg	SN	2,000	22.7	33.7	11.0			35.7
otassium	SW6010	200	MQ/kg	SH	SH	- 0	1730	2			983
odiu	Su6010	5	ma/kg	SE	SE	188	193	307			528
hattium	Sta6010	50.0	mg/kg	SE	92	2	2	욮			77.0
enedium	St#6010	4.0	MQ/kg	SH	2,400	60.5	4.7.4	57.2			71.1
inc	Su6010	2.0	mg/kg	SE	2,000	29.0	86.3	30.0		_	1 61.2
ethylene Chloride	SMB240	0.00	#0/kg	S	SH	0.026	0.026	0.013			0.007
cetone	SM8240	0.010	MO/kg	SH	SE	윺	2	0.20			0.017
2-Butanone	SW8240	0.010	MG/kg	SH	SZ	2	웆	900.0	_	_	3
Toluene	SW8240	0.002	MQ/kg	SE	S#	0.003	0.042	0.014		_	0.058
i-n-butylphthalate	SW6270	0.33	MQ/kg	SN	SN	0.25	97.0	윺			2
is(2-ethylhexyl)ohthalate	S46270	0.33	MQ/kg	SH	SH	0.077	0.02	앞			윺

WI: analyte not fested
WD: analyte not detected.
WD: field blank (ambient condition blank)

R: resample

R: resample

R: resample

R: resample

R: resample

R: resample

A: The federal stringent standard, criteria or action level. See Appendix I.

The federal standard for Nitrate + Witrite is given as 10 mg/l as Nitronen which is equal to the State of California Standard of 45 mg/l

for Nitrate + Witrite given as Nitrate.
Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) WOTES: Results reported for detected analytes only.

TABLE 4.1.2-2 (continued)

				Standards, and Action	Criteria Levels (a)	2-C-3SB BAFB-0118	2-C-3SB BAFB-0119	2-C-3SB BAFB-0120	2-C-358 BAFB-0121	2-C-3SB BAFB-0122	2-C-4SB BAFB-0123
Parameter	Nethod	Detection Limit	Units	Federal	State	20.0-21.5° 12/07/88	25.0-26.5 ¹ 12/07/88	30.0-31.5° 12/07/88	40.0-41.5	50.0-51.5° 12/07/88	5.0-6.5 12/08/88
Description of the second	OFFSF	4 / 4	×	SA	SIR	24.8			18.4		11
	6.0010	֓֞֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֓֡֓֓֡	20/kg	S	S	9			2		3.1
Ali Bire	010978	20.02	/kg	SE	SE	16900	19700	21600	15400	22700	11500
Berita	Suko10	10.0	/k	S	10,000	133			185		84.2
	S146010	100	/k	S	SE	3600			5810		3650
	Su6010	3.0	/k	SE	200	8.62	•		B 47.1	40	8 35.88
Cobell	Successor 10	9	/k	SH	8,000	10.2			30.3		18.1
	SLAKO10		o/ka	S	2,500	41.1			66.3		49.5
1500	010	10.01	/k	S	SH	19900		a	8 37700	•	8 24600 8
Megaposis	01030	900	o/ko	SI	S#	5740			787.0		4390
Menden	010978	5	o/ko	SZ	SH	328			1200		652
	SUKO10	7	o/ko	S	2.000	27.7			25.2		21.7
Dottesting	010975	200	/k	SE	SH	944			515		592
Sodium	SUK010	100	/k	SE	SE	314			174		&
Theilin	01097	20.05	d k	S	2	2			9.89		₽
Vecedin	SUK010	0.4	o/ko	SH	2,400	41.5			74		84.2
2 ioc	SUK010	2.0	o/ko	SZ	2,000	67.8	•	4	B 78.9		0.94
Methylene Chloride	CAM2240	0.00	a/ka	S	N.	0.00	•		B 0.007	•	B 0.065 B
Acetone	072875	0.010	, y	SE	SH	0.020			0.20		윷
Tolinene	07CMTS	0.005	6 /kg	S	SN	0.11			0.043		0.16
Di-n-butylohthalate	SM8270	0.33	6 /kg	SI	SN	€			9		9

e: equipment wash blank f: field replicate R: resemple 8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) ND: analyte not detected.

NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values. NOTES: Results reported for detected analytes only. NT: analyte not tested

a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

For Nitrate + Nitrite given as Nitrate.

Detection limits are for dilutin = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4, 1.2-2 (continued)

				Standards,	Criteria Levela (a)	2-C-4SB BAFR-0124	2-C-4SB RAFR-0125	2-C-4SB BAFB-0126	2-C-4SB BAFB-0186	2-C-4S8' BAFB-0187	2-C-5SB BAFB-0292
		Detection			3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	_	15.0-16.5	20.0-21.5	25.0-26.5	26.5-28.0	7.5-9.0
Parameter	Method	Limit	Units	Feueral	State		12/08/88	12/08/88	12/08/88	12/08/88	12/20/88
Percent Moisture	ASA#9	V/R	×	SN	SR	6.7	22.6	22.1		5.6	14.2
Cyanide	SW0010	0.10	mg/kg	SN	SN	2	9	9		2	윺
	SW6010	20.0	mg/kg	SX	SE	2640	15500	19000	11700	5930	13500
	SUK6010	10.0	mg/kg	SE	10,000	38.9	109	171		53.1	171
Calcin	S46010	100	mo/kg	SX	SH	2840	3310	4160		1680	3760
Chronium	SH6010	3.0	mo/kg	N	200	17.1 8	24.5	31.1	•	25.0	K.7
Cobalt	SW6010	4.0	10 /kg	SN	8,000	11.8	28.4	18.0		7.9	22.1
Comer	SW6010	3.0	mo/ka	S.R.	2,500	23.6	41.5	50.3		29.3	43.8
1100	SW6010	10.0	mo/kg	SI	SH	15600 B	28600	33000	20	1390	26700
Magnesium	SW6010	100	mo/kc	SE	S.W.	2680	2400	2490		3390	2500
Managerese	SI46010	5.5	mo/ko	SI	SE	326	327	1210		275	£
#inte	SW6010	0.4	mo/ko	ST	2.000	10.4	25.8	32.0		19.1	18.6
Potassium	SW6010	200	mo/kg	N	SE	욮	1110	1040		709	315
Sodium	SW6010	6	mo/kg	N	SN	140	962	345		13	165
Thattium	SW6010	50.0	MO/kg	SE	92	윺	86.7	87.9		9	9
Vacadium	SW6010	4.0	Mo/kg	SH	2,400	50.6	73.8	78.3		26.1	88 1.
Zinc	SW6010	2.0	MO/kg	SH	2,000	26.2	53.6	69.5		37.9	24.1
Methylene Chloride	SW8240	0.005	mo/kg	S¥	SH	0.059 B	0.10	8 0.073		0.049	0.007
Trichlocoethene	SW8240	0.002	MQ/kg	SR	2,040	욡	0.018	2		0.00	2
Toluene	SW8240	0.002	mo/kg	SN	SN	0.001	0.16	0.15		0.036	0.047
Di-n-butylphthalate	SW8270	0.33	3 0/kg	SN	SN	욮	0.11	J 0.22	_	≘	E

NOTES: Results reported for detected analytes only. MT: analyte not tested

MD: analyte not detected.

B: analyte detected in blankJ: estimated value, below quantification limitb: field blank (ambient condition blank) MS: No standard criteria or action level currently exists. (): values listed in () are 2nd column confirmation values.

as Values represent most stringent standard, criteria or action level. See Appendix I.

* The faderal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l
for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

e: equipment wash blank f: field replicate R: resample

				Standards,	Criteria	2-C-558 ^R	2-C-5SB	2-C-588 ^R	2-C-558R	2-C-558 ^{fR}	R 2-C-558
		:		and Action	Levels (a)	BAFB-0535	BAFB-0294	BAFB-0536		BAFB-0538	
Parameter	Method	Detection Limit	Units	Federal	State	05/03/89	17.0-19.0 ¹ 12/20/88	20.0-21.5	. 5. 15 -0.05 05/03/89	05/03/89 05/03/89	12/20/88
Percent Moisture	ASAMO	M/A	×	SE	SE	=	12.1	=	21.1	22.5	26.4
Atuminum	Suc 010	20.0	mg/kg	SM	SI	Ħ	13800	H	17000	21700	14300
Berice	Sta6010	10.0	mg/kg	SN	10,000	1	8.0	H	147	145	133
Calcium	S 46010	100	mo/kg	SN	SE	Ħ	4850	H	4540	3510	3740
Chromium	\$46010	3.0	mg/kg	SM	200	Ħ	40.5	H	42.7	37.9	23.1
Cobelt	Stat6010	4.0	mg/kg	SN	8,000	H	23.0	H	16.5	20.6	14.9
Copper	Sta6010	3.0	mo/kg	SH	2,500	Ħ	50.5	H	43.2	39.5	3 8.1
Iron	SW6010	10.0	mo/kg	SH	SM	H	28600	H	30200	34300	26100
Magnesium	Su6010	0 0	mg/kg	SH	SE		3540	H	7530	2470	5030
Nanganese	SW6010	1.5	ma/kg	SN	SE	=	617	H	627	761	573
Nickel	S46010	0.4	mo/kg	SH	2,000	둒	24.2	H	29.3	33.8	24.5
Potassium	St#6010	5 00	mg/kg	SM	SH	Ħ	34.1	H	938	1230	639
Sodium	Su6010	50	mg/kg	ST	SN	Ħ	461	H	677	413	925
Thellium	SI46010	20.0	80 /kg	S#	8	H	74.1	K	2	욮	7.98
Vanadium	SW6010	6. 0	mo/kg	KS	2,400	×	91.5	Ħ	8.09	93.8	57.1
Zinc	Stu6010	2.0	MQ/kg	SH	2,000	Z	56.7	H	61.7	62.7	60.5
Methylene Chloride	SM8240	0.005	mg/kg	SH	SN	Ħ	900.0	¥	0.015	J 0.012	0.005
Acetone	SNB240	0.010	mg/kg	S	SN	H	0.008	THE T	0.032	9	0.012
Chloroform	SM8240	0.005	mg/kg	SH	SN	Ħ	읖	Ħ	0.013	2	윺
2-Butanone	SNB240	0.010	m 0/kg	SN	N	Ħ	욡	Ħ	2	₽	0.018
Vinyl Acetate	SN8240	0.010	MQ/kg	SE	SN	<u></u>	2	H	2	윺	0.008
Benzene	SW8240	0.002	mg/kg	SE	SN	=	2	H	2	윺	0.012
4-Methyl-2-Pentanone	SN8240	0.010	mo/kg	SE	SH	Ħ	2	H	2	윺	0.011
Toluene	SNB240	0.002	mg/kg	SH	SE	Ħ	0.032	H	0.18	0.081	0.086
N-Witrosodimethylamine	SWB270	0.33	mg/kg	S W	N	0.060	H	0.056	2	Ş	×

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) WOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

				Standards, and Action	Criteria Levels (a)	2-C-558 ^K BAFB-0539	2-C-5SB BAFB-0297	2-C-558 ^K BAFB-0540	2-C-6SB BAFB-0298	2-C-6SB BAFB-0299	2-C-6SB BAFB-0300
arameter	Hethod	Detection Limit	Units	Federal	State		47.5-49.0° 12/20/88				
ercent Moisture	ASA#9	A/M	×	SN	SN		18.8	1	14.2	21.1	20.4
yanide	Sup010	0.10	mg/kg	SN	SE	12	2	Ħ	2	2	0.13
Aluminum	Su6010	20.0	mg/kg	SE	SN	H	21300	Ħ	10900	22700	14600
	Su6010	10.0	mo/kg	SN	10,000		150	×	131	8.7	415
eryllium	Su6010	0.50	mg/kg	SN	ĸ	-	Ş	H	Q	0.76	0.73
alcium	SW6010	90	mg/kg	SH	S¥	×	6220	Ħ	2060	5720	4670
hromium	SW6010	3.0	mg/kg	SN	200	¥	0.99	Ħ	31.7	6.3	39.7
obal t	S46010	4.0	mo/kg	SX	8,000	Ħ	28.8	H	31.7	25.3	36.7
opper	Su6010	3.0	MO/kg	SE	2,500	=	65.1	M	32.1	73.4	47.9
. E	S46010	10.0	mg/kg	SH	SZ	F	43300	L N	24600	76300	30700
bgnes i um	SW6010	5	MQ/kg	SN	SE	H	8250	Ħ	3240	9070	7840
anganese	Su6010	1.5	mo/kg	SM	SE	H	839	H	1160	220	1960
ickel	Su6010	4.0	MQ/kg	SN	2,000	-	31.0	IN	16.3	36.1	43.7
otassium	Su6010	200	mo/kg	SE	SN	×	295	N	807	906	દ
odica	Stu6010	9	MQ/kg	SN	SX	T.N	232	H	225	430	313
snadium	SW6010	4.0	mg/kg	SE	2,400	*	74	H	83.8	143	\$ \$
inc	SW6010	2.0	MQ/kg	SH	2,000	*	81.7	H	37.6	85.7	63.4
Methylene Chloride	SW8240	0.002	MO/kg	SH	SH	H	0.005	L N	2	2	2
cetone	SW8240	0.010	MO/kg	SH	SH	H	0.023	H		윺	2
-But anone	SW8240	0.010	MQ/kg	S¥	SX	EM.	_	H		2	2
oluene	SM8240	0.005	mg/kg	SH	SH	I	_	H		2	0.25
-Nitrosodimethylamine	SW8270	0.33	MQ/kg	SZ	SN	0.066		. 79.0	_	2	2

WOTES: Results reported for detected analytes only.

WI: analyte not tested

WI: analyte not detected

WI: analyte not detected.

WI: analyte not detected in blank

WI: analyte not detected.

WI: analyte not detected.

WI: analyte not detected.

WI: analyte not detected imit for detected responsible in the standard for detection limits for each analysis are given in Appendix A.

WI: analyte not detected residually for detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

				Standards,	Criteria	2-c-68	2-c-6SB	2-C-78B	2-C-7SB	2-C-758 ^R	2-C-7SB
				and Action	and Action Levels (a)	BAFB-0301	BAFB-0302	BAFB-0090	BAFB-0091	BAFB-0420	BAFB-0092
		Detection				38.5-40.0	48.5-50.0	0.0-1.5	10.0-11.5	10.0-10.5	20.0-21.5
Parameter	Method	Limit	Units	Federal	State	12/21/88	12/21/88	12/02/88	12/02/88	01/20/89	12/02/88
Percent Moisture	ASA#9	4/M	><	SN	SN	26.4	14.8	16.9	13.1	7	7.9
Aluminum	Su6010	20.0	mg/kg	SN	SN	27400	11300	16800	14600	H	10000
	Su6010	10.0	mg/kg	SZ	10,000	186	180	126	73.8	I	46.3
Beryllica	Succo 10	0.50	mo/kg	N	ĸ	0.82	2	9	윺	×	2
Calcium	Su6010	5	mg/kg	SN	SE	2490	4080	5200	0667	H	0009
Chromium	SW6010	3.0	MQ/kg	SN	200	36.5	31.5	45.6	33.9	H	25.7
Cobalt	Su6010	0.4	30/kg	SN	8,000	17.7	27.8	24.1	20.7	E	11.9
Copper	S46010	3.0 8	MQ/kg	SN	2,500	61.8	52.6	54.4	50.7	×	27.1
To-	SW6010	10.0	MQ/kg	SN	SN	37500	31100	31500	27800	I	18700
Magnesium	Su6010	5	10 /kg	SN	SE	8860	6470	2420	5200	H	3320
Manganese	Su6010	1.5	mo/kg	SN	SX	682	1070	882	636	Ħ	777
Nickel	Su6010	0.4	MO/kg	SH	2,000	43.5	21.1	7.62	21.9	H	16.3
Potassium	SW6010	200	10 /kg	SN	SH	1330	282	481	368	H	271
Sodium	Sw6010	5	10 /kg	SN	SH	977	168	162	151	H	221
Thattion	SW6010	50.0	mg/kg	SN	82	86.8	2	2	2	H	9
Vanadium	SW6010	0.4	mo/kg	SH	2,400	¢.5	6.96	98.6	86.2	H	24.7
Zinc	SW6010	2.0	mg/kg	SN	2,000	8.5	61.7	56.9	52.4	H	34.0
Methylene Chloride	SW8240	0.005	mo/kg	SN	SN	욡	2	0.034	6 0.20	H	0.22
Acetone	SM8240	0.010	mo/kg	SE	SH	2.3	2	0.018	0.77	M	0.38
1,1,2,2-Tetrachloroethane	SN8240	0.005	mo/kg	SW	SE	욡	9	욮	윺	H	0.008
Toluene	SN8240	0.005	mg/kg	SE	SH	0.30	2	2	≩	H	욡
Phenol	Su6270	0.33	mo/kg	SE	SE	2	2	0.83	E X	욮	Ħ
Di-n-butylphthalate	SIJ6270	0.33	mg/kg	SE	SH	9	2	0.20	L	윺	Ħ
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	SE	SI	욮	2	2	Ħ	0.13	TN T
								*********			1 1 1 1 1 1 1 1 1 1

NOTES: Results reported for detected analytes only.

NI: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution * 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

				and Action Levels (a	Levels (a)	BAFB-0421	BAFB-0422	BAFB-0093	6-L-738 BAFB-0423		BAFB-0095
Parameter	Method	Limit	Units	Federal	State	01/20/89	01/20/89	12/02/88		12/02/88	12/02/88
Percent Moisture	ASA#9	N/A	×	SN	SE		=	16.7		19.2	: : :
Aluminum	S46010	20.0	mg/kg	SE	S¥	Ŧ	H	11500	12	23300	-
Berium	Su6010	10.0	mg/kg	SN	10,000	Ħ	H	0.62	=	144	 \$
Beryllium	Su6010	0.50	mg/kg	SH	ĸ	H	H	욮	H	0.62	
Calcium	SM6010	5	mQ/kg	SW	N	H	H	2970	I	2540	
Chromium	Su6010	3.0	mg/kg	S W	200	H	H	70.7	H	36.8	
Cobelt	SW6010	6.0	mo/kg	SW	8,000	H	Ħ	12.0	H	19.8	
Copper	SW6010	3.0	mo/kg	SX	2,500	×	H	33.0	H	71.7	
- For	S46010	10.0	MQ/kg	WS	NS	L R	H	20500	IN	35400	• •
Magnesium	St46010	5	MQ/kg	SR	SE	Ħ	H	3830	H	950	
Nanganese	SW6010	1.5	mo/kg	SN	SN	Ħ	Ħ	295	H	847	
Wicket	SW6010	4.0	mg/kg	SN	2,000	Ħ	H	24.8	F	31.1	
Potessium	SW6010	200	mg/kg	SX	SN	H	H	909	1	915	
Sodium	SW6010	5	mo/kg	SH	S	¥	Ħ	252	T.W	218	
Thattiem	SW6010	50.0	mg/kg	SE	700	H	H	60.3	H	70.3	
Vanedium	SW6010	4.0	mg/kg	SN	2,400	H	H	50.9	H	101	
Zinc	SW6010	2.0	MO/kg	SN	5,000	Ħ	H	48.5	H	74.6	
Methylene Chloride	SMB240	0.005	mg/kg	S#	NS	L	H	0.048	E	0.19	_
Acetone	SNB240	0.010	Mg/kg	SE	SE	H	H	0.23	H	1.1	
Toluene	SW8240	0.005	Mg/kg	S#	SZ	T	F	윷	H	0.015	~ ~
Phenol	SW8270	0.33	Mg/kg	SH	S.	윺	9	H	2	2	
Benzoic Acid	SW8270	1.6	mg/kg	SH	SZ	윺	9	H	2	2	
Phenanthrene	SW8270	0.33	mg/kg	SZ	SZ	9	2	H	2	윷	_
Di-n-butyiphthalate	SMB270	0.33	mg/kg	SN	SE	2	₽	F	2	0.22	2
Fluoranthene	SW6270	0.33	mg/kg	SN	SE	욮	2	H	₽	9	_
Pyrene	SW8270	0.33	Mg/kg	SN	SZ	윺	2	Ħ	욯	윺	_
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	SN	SN	0.12 J	0.095	TH T	₹	욮	
Chrysene	SWB270	0.33	mg/kg	SN	SE	2	2	H	2	욮	_

WOIES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank)

R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 2

				Standards, and Action	Criteria Levels (a)	2-C-1GN	2-C-1GW	2-C-1GW	2-C-1GW ^b	2-A-1GW	2-R-1GW
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0477 03/07/89	BAFB-0478 03/07/89	BAFB-0476 03/07/89	BAFB-0480 03/07/89	BAFB-0481 03/08/89	BAFB-0464 02/20/89
Specific Conductivity	£120.1	1.0	Carbos/ca	SX	86	239	239	=	=	250	328
Temperature	E170.1	K/A	opeg C	S#	SE	18.5	18.5	18.0	IN	18.0	19.3
T	E150.1	M/A	ā	2-9	SE	6.91	6.91	7.00	IN	7.28	6.81
Alkalinity - Total	S#403	1.0	<u>`</u>	2	SE	7.98	4.8	2.8	H	4.98	65.2
Sicarbonate	S# #03	1.0	1/02	SE	SH	117.6	117.6	3.4	H	105.4	3.5
Total Dissolved Solids	E160.1	3.0	1/0	200	200	192	186	5.0	=	216	262
Chloride	E325.3	1.0	7	220	250	16.8	16.8	2		21.8	27.8
Fluoride	E340.2	0.020	7/02	7	1.4	0.20	0.21	윺	I	0.15	0.15
Nitrate + Mitrite	E353.3	0.050	7	10	45	16.5	17.5	0.18	H	16.5	25.3
Sul fate	E375.4	1.0	-\- 	250	250	12.7	12.2	9	=	30.5	48.8
Cyanide	SW9010	0.0100	7/2	SE	SH	€	욮	윷	H	0.0200	2
Colcium	Sta6010	9.1	7	SE	SH	22.4	22.2	욮	H	21.2	30.2
Iron	SW6010	0.100	1/01	ĸ.	r;	3	2	9		0.763	웆
Megnesium	Su6010	5.8	7	SH	SE	13.1	13.0	2	Ħ	14.0	20.8
Nanganese	SN6010	0.0150	7	50.	8	9	2	윷	H	0.0820	욮
Potassium	SW6010	- .8	3 0	SE	SH	1.40	1.6	€	E	욡	욯
Sodium	SW6010	1 .8	7	SE	SH	14.1	14.0	₽	H	14.1	13.0
2 inc	Su6010	0.0200	7/2	0.110	0.012	0.0340	0.0320	욮	I	2	욡
Trichloroethene	SUB010	-	7/85	'n	5	2(3)	2(3)	웆	9	₽	2
Toluene	SNB020	-	1/ 6 0	14,300	5	3(3)	3(4)	욡	皇	2	2
Phenol	SMB270	5	1/85	SE	SE	9	2	유	2	3	۲ م
bis(2-Ethylhexyl)Phthalate	SuB270	2	1/85	SE	SN	4	9	M	L	4	7 M

e: equipment wash blank f: field replicate R: resample 8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) ND: analyte not detected. NS: No standard criteria or action level currently exists. NOTES Results reported for detected analytes only. MT: analyte not tested

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

for Nitrate + Nitrite given as Nitrate. Detection limits. Actual detection limits for each analysis are given in Appendix A.

TARIF 4.1.2-2 (continued

					Standards, Criteria and Action Levels (Standards, Criteria and Action Levels (a)	2-R-2GU	2-R-3GH	2-B-4GU	
Method Limit Units Federal State 02/17/89 02/17/89 E120.1 1.0 umhos/cm			Detection	c			BAFB-0463	BAFB-0460	BAFB-0462	
E120.1 1.0 Lumhos/cm NS 900 750 556 E170.1 M/A deg C NS NS 17.1 18.0 E170.1 M/A deg C NS NS 17.1 18.0 E150.1 M/A deg C NS NS 17.1 18.0 SW403 1.0 mg/l 20 NS 58.0 76.8 90.3 E160.1 3.0 mg/l 20 S00 236 435 E35.3 1.0 mg/l 250 250 18.7 63.7 E340.2 0.050 mg/l 250 250 18.7 63.7 E376.2 0.050 mg/l 10° 45 24.1 19.9 E375.4 1.0 mg/l NS NS NS ND ND ND SW6010 1.00 mg/l NS NS 21.3 50.0 SW6010 1.00 mg/l NS NS 14.5 33.4 50.0 SW6010 1.00 mg/l NS NS 11.2 19.7 19.7 sw6010 1.00 mg/l NS NS 11.2 19.7 19.7 sw6010 1.00 mg/l NS NS 11.2 19.7 sw6010 1.00 mg/l NS	Parameter	Method	Limit		Federal	State	02/17/89	02/17/89	02/17/89	
E170.1 N/A deg C NS NS 17.1 18.0 E150.1 N/A pH 5-9 NS 6.96 6.94 SW403 1.0 mg/l 20 NS 58.0 74.0 SW403 1.0 mg/l 20 S00 236 435 E160.1 3.0 mg/l 250 250 18.7 63.7 E340.2 0.050 mg/l 10* 45 24.1 19.9 E375.4 1.0 mg/l 250 250 31.3 130 SW4010 0.0100 mg/l NS NS ND ND ND SW6010 1.00 mg/l NS NS 14.5 33.4 SW4010 1.00 mg/l NS NS 11.2 19.7	Specific Conductivity	E120.1	1.0	Carros/ca	SE	0	250	556	235	
E150.1 N/A pH 5-9 NS 6.96 6.94 SW403 1.0 mg/l 20 NS 58.0 74.0 SW403 1.0 mg/l 20 NS 58.0 74.0 E160.1 3.0 mg/l 500 500 236 435 E355.3 1.0 mg/l 250 250 18.7 63.7 E340.2 0.050 mg/l 10* 45 24.1 19.9 E375.4 1.0 mg/l NS NS ND ND ND ND ND SW6010 1.00 mg/l NS NS 14.5 50.0 SW6010 1.00 mg/l NS NS 14.5 50.0 SW6010 1.00 mg/l NS NS 14.5 33.4 Jfor detected analytes only. B: analyte detected in blank d.	Temperature	£170.1	W/W	deg c	SN	SN	17.1	18.0	18.0	
SM403 1.0 mg/l 20 NS 58.0 74.0 SM403 1.0 mg/l NS 70.8 90.3 E160.1 3.0 mg/l 500 500 236 435 E325.3 1.0 mg/l 250 250 18.7 63.7 E340.2 0.050 mg/l 10* 45 24.1 19.9 E375.4 1.0 mg/l NS NS ND ND SW6010 0.0100 mg/l NS NS 21.3 50.0 SW6010 1.00 mg/l NS NS 21.3 50.0 SW6010 1.00 mg/l NS NS 14.5 33.4	₹.	£150.1	Y / R	Z	2-9	S¥	96.9	8.9	6.83	
### 250	Alkalinity - Total	SM4 03	1.0	7	50	SN	58.0	74.0	102.0	
E160.1 3.0 mg/l 500 500 236 435 E325.3 1.0 mg/l 250 250 18.7 63.7 E340.2 0.050 mg/l 10° 45 24.1 19.9 E375.4 1.0 mg/l 10° 45 24.1 19.9 SW6010 1.00 mg/l 10° 10° 14.5 SW6010 1.00 mg/l 10° 11.2	Bicarbonate	SH4 03	1.0	7/2	SN	SN	70.8	8.08	124.4	
E325.3 1.0 mg/l 250 250 18.7 63.7 E340.2 0.050 mg/l 2 1.4 0.15 0.12 E353.3 0.050 mg/l 10* 45 24.1 19.9 E375.4 1.0 mg/l 250 250 31.3 130 ND ND SW6010 1.00 mg/l NS NS NS ND ND ND SW6010 1.00 mg/l NS NS 14.5 33.4 SW6010 1.00 mg/l NS NS 11.2 19.7 II.2 19.7 II.2 ifor detected analytes only. B: analyte detected in blank d. d. estimated value, below quantification d.	Total Dissolved Solids	£160.1	3.0	1/0	200	200	236	435	231	
E340.2 0.050 mg/l 2 1.4 0.15 0.12 E353.3 0.050 mg/l 10* 45 24.1 19.9 E375.4 1.0 mg/l 250 250 31.3 130 ND ND SW6010 0.0100 mg/l NS NS NS ND ND ND SW6010 1.00 mg/l NS NS 21.3 50.0 SW6010 1.00 mg/l NS NS 14.5 33.4 SW6010 1.00 mg/l NS NS 14.5 33.4 SW6010 1.00 mg/l NS NS 14.5 17.2 19.7 Ifor detected analytes only. B: analyte detected in blank d. d. estimated value, below quantification d.	Chloride	E325.3	1.0	Š	250	250	18.7	63.7	21.4	
Mitrite E353.3 0.050 mg/l 10° 45 24.1 19.9 E375.4 1.0 mg/l 250 250 31.3 130 ND ND SW010 0.0100 mg/l NS NS NS ND ND ND SW010 1.00 mg/l NS NS 21.3 50.0 SW0010 1.00 mg/l NS NS 14.5 33.4 SW010 1.00 mg/l NS NS 14.5 33.4 SW010 1.00 mg/l NS NS 14.5 19.7 Sw1ts reported for detected analytes only. B: analyte detected in blank te not detected.	Fluoride	E340.2	0.050	7/5	~	1.4	0.15	0.12	0.15	
E375.4 1.0 mg/l 250 250 31.3 130 mg/l 85 ks ws	Nitrate + Mitrite	£353.3	0.050	ž	10	45	24.1	19.9	18.6	
Sub010 0.0100 mg/l NS NS ND ND ND ND Sub010 1.00 mg/l NS NS 21.3 50.0 Sub010 1.00 mg/l NS NS 14.5 33.4 Sub010 1.00 mg/l NS NS 11.2 19.7 aults reported for detected analytes only. En not tested tent detected analytes only. Es analyte detected in blank te not detected.	Sulfate	E375.4	1.0	7	250	250	M. 18	130	10.7	
Su6010 1.00 mg/l NS NS 21.3 50.0 Su6010 1.00 mg/l NS NS 14.5 33.4 Su6010 1.00 mg/l NS NS 11.2 19.7 sults reported for detected analytes only. En not tested te not detected.	Cyanide	Su-9010	0.0100	1/2	SX	SE	Q	9	0.0300	
SM6010 1.00 mg/l NS NS 14.5 33.4 SM6010 1.00 mg/l NS NS 11.2 19.7 sults reported for detected analytes only. B: analyte detected in blank te not detected. J: estimated value, below quantification	Calcium	S46010	8.	1/02	S¥	S	21.3	20.0	7 22	
SM6010 1.00 mg/l NS NS 11.2 19.7 : Results reported for detected analytes only. B: analyte detected in blank halyte not tested J: estimated value, below quantification	Magnes i La	Su6010	. 8	1	SH	SI	14.5	33.4	15.6	
B: analyte detected in blank J: estimated value, below quentification	Sodium	SW6010	 8	1/2	SN	SN	11.2	19.7	٥	
B: analyte detected in blank J: estimated value, below quantification	NOTES: Results reported f	or detected	analytes	anty.	• • • • • • • • • • • • • • • • • • •				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	MD: analyte not detected.					nalyte dete stimmeted va	cted in blan lue, below o	nk nuantificat	ini t	e: equipment wash blank
exists. b: field blank (ambient condition blank)	NS: No standard criteria	or action le	evel curre	ntly exists	<u>ق</u>	ield blank	(ambient con	dition bla	, , (¥)	R: resample

Detection limits are for dilution * 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. MD: analyte not detected.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level condition blank)

MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: resample

MS: No standard in () are 2nd column confirmation as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l

MS: No standard in () are 2nd column confirmation confirmation

TABLE 4.1.2-2

BEALE AFB: WATER DATA 2ND ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 2

		•		Standards, C and Action L	Criteria Levels (a)		2-C-16W				
Parameter	Hethod	Detection Limit	Units	Federal	State	BAFB-0572 06/05/89	8AFB-05/3 06/05/89	BAFB-05/4 06/05/89	8AFB-05/5 06/05/89	BAFB-0571 06/02/89	BAFB-0589 06/12/89
Specific Conductivity	E120.1	0.1	Carbos/cm	SN	8	241	241	=	-	240	:
Temperature	E170.1	4/ %	des C	SH	SE	19.0	19.0	Ħ	H	19.5	
-	E150.1	N/A	Ŧ	2-9	E SE	7.40	7.40	H	H	7.37	
Alkalinity - Total	SP4.03	1.0	mg/l	2	SE	=	*	*	=	78.0	
Bicarbonate	S#403	1.0	1/0W	SN	SZ	Ħ	H	×	H	8.5	88.8
Total Dissolved Solids	E160.1	3.0) 	200	200	2560	567	9.9	×	248	
Chloride	E325.3	1.0	1/2	520	250	17.5	16.5	2	Ħ	19.9	
Fluoride	E340.2	0.050	7	~	1.4	0.19	0.19	¥	Ħ	0.14	
zitrate + zitrite	E353.3	0.050	7/0	10*	45	18.3	19.1	0.36	H	21.0	
Sulfate	E375.4	1.0	7/92	250	220	12.1	10.5	9	H	14.4	
Cyanide	SW9010	0.0100	1/0	SI	SN	2	2	2	H	0.0400	
Colcium	SW6010	8.	1/0	SE	N	20.5	20.3	2	H	20.1	
Magnesium	SW6010	9.	1/2	SE	SN	12.6	12.4	윤	H	13.5	
Hendenese	SW6010	0.0150	7/0	20.	ક	3	욮	욡	Ħ	0.0550	
Potassium	SW6010	1.0	1/0	SE	SH	욮	2	₽	Z	1.20	
Sodium	SW6010	1.00	7/4	S¥	W	12.2	12.1	윭	T.W	10.6	
Zinc	SW6010	0.0200	1/0	0.110	0.012	0.0230	2	2		9	
Chloroform	SW8010	-	3	SE	5	9	2	3(2)	3(3)	2	CE
Toluene	SW8020	_	7/95	14,300	100	2	유	2	6(5)	3(2)	₽
Phenol	SW8270	5	7	SZ	SN	Ş	욮	2	×	욮	71
N-Nitrosodiphemylamine (1)	SW8270	2	7/85	SN	SN	2	2	9 18	BJ ★1	2	8.7
Di-n-Buty(phthalate	SH8270	5	7/95	S¥	SN	2	¥	¥	F	₽	m
bis(2-Ethylhexyl)Phthalate	SW8270	5	700	SE	SE	22	7) 26	Ħ	5	7

MOTES: Results reported for detected analytes only. MT: analyte not tested

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NS: No standard criteria or action level currently exists. MD: analyte not detected.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2 (continued)

Units Federal State 06/12/89 06/09/89 06/13/89 Umbtos/cm NS NS 19.0 20.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19					Standards and Action	Standards, Criteria and Action Levels (a)	2-R-2GH	2-R-3GH	2-R-4GN	
E120.1 1.0 umbos/cm NS 900 265 610 268 E170.1 M/A deg C NS NS 7.77 6.88 6.93 69.5 19.5 89.63 89.63 10.0 mg/l 20 NS 7.77 6.88 6.93 69.63 89.63 1.0 mg/l 20 NS 78.1 96.6 107.6 1		1	Detection		landana	61410	BAFB-0588 04/12/80	BAFB-0587 04/00/89	BAFB-0594 06/13/89	
E170.1 1.0 umhos/cm NS 900 265 610 268 E170.1 NA deg C NS NS 19.0 20.5 19.5 SM403 1.0 mg/l NS 64.0 234 646 26.3 SM403 1.0 mg/l NS 78.1 96.6 107.6 E325.3 1.0 mg/l NS 78.1 96.6 107.6 E325.3 1.0 mg/l NS 78.1 96.6 107.6 E325.3 0.050 mg/l 10° 250 19.9 66.8 20.1 E335.4 0.050 mg/l 10° 45 29.2 19.6 19.5 E375.4 1.0 mg/l NS NS 0.0100 ND 0.0200 SW6010 1.00 mg/l NS NS 11.4 34.1 14.7 SW6010 1.00 mg/l NS NS 11.4 20.0 11.6 SW6010 1.00 mg/l NS NS 11.4 20.0 11.2 SW6010 1.00 mg/l NS NS ND ND ND 11.60 SW6010 1.00 mg/l NS NS ND ND ND 11.60 SW6010 1.00 mg/l NS NS ND ND ND 11.60 SW6010 1.00 mg/l NS NS ND 6(1) ND 11.60 SW6010 1.00 mg/l NS NS ND 6(1) ND 11.60 SW6020 1 ug/l NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS NS ND 6(1) ND ND 11.60 SW6270 10 ug/l NS NS NS NS NS ND 6(1) ND ND ND 11.60 SW6270 10 ug/l NS	Yar ame (e.	DOLLAR TO) III .	9		, , , , , , , , , , , , , , , , , , , ,	20 /20 /20			
E170.1 N/A deg C NS NS 19.0 20.5 19.5 19.5 sw403 1.0 mg/1 S NS 6.69 NS 7.17 6.88 6.93 sw403 1.0 mg/1 NS NS 64.0 70.2 88.2 sw403 1.0 mg/1 NS NS 781 96.6 107.6 107.6 sw201 1.0 mg/1 S NS 781 96.8 20.1 10.2 mg/1 S NS 781 96.8 20.1 10.2 mg/1 S NS 781 96.8 20.1 10.2 mg/1 S NS 781 96.8 20.1 10.1 10.1 10.1 10.1 10.1 10.1 10.1	Specific Conductivity	E120.1		umpos/cm	SE	006	265	610	268	
E150.1 NA pH 5-9 NS 7.17 6.88 6.93 SW403 1.0 mg/l 20 NS 64.0 77.2 88.2 SW403 1.0 mg/l 20 NS 64.0 77.2 88.2 SW403 1.0 mg/l 200 500 234 468 20.1 E325.3 1.0 mg/l 250 250 19.9 66.8 20.1 E325.3 1.0 mg/l 250 250 19.9 66.8 20.1 E335.3 0.050 mg/l 10° 45 29.2 19.6 15.7 E335.4 1.0 mg/l 250 250 19.9 66.8 20.1 SW5010 0.0100 mg/l NS NS 0.0100 ND 0.0200 SW5010 1.00 mg/l NS NS 20.8 51.8 21.6 SW5010 1.00 mg/l NS NS 11.4 20.0 12.2 SW5010 1.00 mg/l NS NS 11.4 20.0 12.2 SW5010 1.00 mg/l NS NS NS ND 16.0 SW5010 5 ug/l NS NS NS ND 16.0 SW5020 10 ug/l NS NS NS ND	Temperature	E170.1		0	SE	SN	19.0	20.5	19.5	
\$844.03 1.0 mg/l 20 NS 64.0 79.2 88.2 \$844.03 1.0 mg/l \$00 \$00 \$24 \$46 \$107.6 \$844.03 1.0 mg/l \$00 \$50 \$24 \$46 \$20.3 \$16.1 3.0 mg/l \$20 \$14 \$0.12 \$0.14 \$10.16	7	E150.1	4/2	đ	2-9	SH	7.17	6.88	6.93	
## \$403 1.0 mg/l NS	Aikalinity - Total	S#403	1.0	1/04	20	SN	6.9 8.0	29.5	88.2	
solved Solids E160.1 3.0 mg/l 500 534 468 26.3 20.1 sizes. E325.3 1.0 mg/l 250 250 19.9 66.8 20.1 colid mg/l 250 250 19.9 66.8 20.1 colid mg/l 10° 45 29.2 19.6 19.5 colid mg/l 10° mg/l 10° 10° 10° 11° 11° 11° 15.7 colid mg/l 10° mg/l 10° 11° 11° 11° 11° 11° 11° 11° 11° 11°	Bicarbonate	S44.03	1.0	/0	SE	SE	78.1	9.96	107.6	
### ### ##############################	Total Dissolved Solids	E160.1	3.0	1/0	200	200	3 5	897	263	
Hitrite E340.2 0.050 mg/l 2 1.4 0.14 0.12 0.14 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5	Chloride	E325.3	1.0	1/0	220	250	19.9	8.8	20.1	
Hitrite E353.3 0.050 mg/l 10° 45 29.2 19.6 19.5 19.5 SW010 0.0100 mg/l 250 250 28.6 116 15.7 SW010 0.0100 mg/l NS NS 0.0100 ND 0.0200 ND	Fluoride	E340.2	0.050	7	2	1.4	0.14	0.12	0.14	
E375.4 1.0 mg/l 250 250 28.6 116 15.7 Sw9010 0.0100 mg/l NS NS 0.0100 ND 0.0200 ND 0.0200 Sw9010 0.0100 mg/l NS NS 20.8 51.8 21.6 21.6 Sw6010 1.00 mg/l NS NS 14.1 34.1 14.7 14.7 14.7 Sw6010 1.00 mg/l NS NS ND ND ND 1.60 12.2 Sw8010 1.00 mg/l NS NS NS ND 6(1) ND 12.2 Sw8020 1 ug/l NS NS NS NS ND 8(13) ND ND HD ND Sw8270 10 ug/l NS	+	E353.3	0.050	7	10*	45	29.5	19.6	19.5	
SM9010 0.0100 mg/l NS NS 0.0100 ND 0.0200 SM6010 1.00 mg/l NS NS 14.1 34.1 14.7 SM6010 1.00 mg/l NS NS 14.1 34.1 14.7 SM6010 1.00 mg/l NS NS ND ND 12.2 SM6010 1.00 mg/l NS NS ND ND 12.2 SM6010 1.00 mg/l NS NS ND 8(13) SM8020 1 ug/l NS NS NS NS ND 38(13) SM8270 10 ug/l NS NS NS NS ND	Sulfate	E375.4	1.0	\ \ \ \ \ \	250	250	28.6	116	15.7	
Su6010 1.00 mg/l NS NS 20.8 51.8 21.6 Su6010 1.00 mg/l NS NS 14.1 34.1 14.7 Su6010 1.00 mg/l NS NS NS ND ND 1.60 NG/l NS NS NS ND ND 1.60 NG/l NS NS NS ND 6(1) ND ND 12.2 Su8020 1 ug/l NS NS NS NS ND 6(1) ND	Cyanide	SI-9010	0.0100	7	SE	SN	0.0100	윺	0.0200	
SM6010 1.00 mg/l NS NS ND ND 1.60 SM6010 1.00 mg/l NS NS ND ND 1.60 SM6010 1.00 mg/l NS NS ND 6(1) ND 12.2 chloride SW8020 1 ug/l 14,300 100 3 ND 38(13) SW8270 10 ug/l NS NS 7 J 6 BJ 5 J iphthalate SW8270 10 ug/l NS NS 7 J 6 BJ 5 J iphthalate SW8270 10 ug/l NS NS 7 J 6 BJ 5 J isaults reported for detected analytes only. He smalyte detected in blank He stimated value, below quantification limit f:		Su6010	1.00	7	SE	KS	20.8	51.8	21.6	
SM6010 1.00 mg/t NS NS ND ND 1.60 12.2 SM6010 1.00 mg/t NS NS NS 11.4 20.0 12.2 Chloride SW8010 5 ug/t NS NS NS ND 6(1) ND 38(13) SW8020 1 ug/t 14,300 100 3 ND 38(13) SW8270 10 ug/t NS NS NS NS NS ND	Magnesium	Sw6010	-8	1/0	SE	S¥	14.1	¥.1	14.7	
Sub010 1.00 mg/l NS NS 11.4 20.0 12.2 sub010 5 ug/l NS NS ND 6(1) ND 38(13) Sub020 1 ug/l 14,300 100 3 ND 38(13) ND 10 ug/l NS NS 13 ND ND ND ND ND ND ND NS NS 7 J 6 BJ 5 J ND ND ND ND ND NS NS 3 J ND	Potassica	SW6010	- 8	1/0	N	S#	۽	윷	1.60	
Su8010 5 ug/l MS MS MD 6(1) MD Su8020 1 ug/l 14,300 100 3 ND 38(13) Su8020 1 ug/l 14,300 100 3 ND 38(13) Su80270 10 ug/l MS MS 7 J 6 BJ 5 J ND MD MD Su80270 10 ug/l MS MS 3 J MD MD MD CHelate Su80270 10 ug/l MS MS 3 J 11 2 J OFFE FOR THE SURFACE OFFE GOOD CONTROL OF SURFACE OFFE GOOD CONTROL OFFE GOOD CONTROL OF SURFACE OFFE GOOD CONTROL OFFE GOOD CO	Sodiu	SW6010	8.	1/0	SN	S	11.4	20.0	12.2	
SuB020 1 ug/l 14,300 100 3 ND 38(13) suB270 10 ug/l NS 13 ND ND ND suB270 10 ug/l NS 3 J ND ND thelate SuB270 10 ug/l NS 3 J 11 2 J orted for detected analytes only. B: analyte detected in blank B: analyte detected in blank e: tected. J: estimated value, below quantification limit f:	Methylene chloride	SW8010	~	7/05	SR	SN	9	6(1)	Q	
Su6270 10 ug/l NS NS 13 ND ND ND	Toluene	SW8020	-	7		5	M	2	38(13)	
ine (1) \$46270 10 ug/l NS NS 7 J 6 BJ 5 J thalate \$46270 10 ug/l NS NS 3 J ND ND thalate \$46270 10 ug/l NS NS 3 J 11 2 J orted for detected analytes only. B: analyte detected in blank tected.	Phenol	Sw8270	2	7/05	SN	SE	13	윺	윺	
Su8270 10 ug/l MS MS 3 J MD MD thalate Su6270 10 ug/l MS MS 3 J 11 2 J orted for detected analytes only. B: analyte detected in blank tected. J: estimated value, below quantification limit f:	M-Witrosodiphenylamine (1)	SW6270	2	7/85	SE	SN	7	9	8J 5 J	
thelate Su8270 10 ug/l NS NS 3 J 11 2 J orted for detected analytes only. B: analyte detected in blank tected. J: estimated value, below quantification limit f:	Di-n-Butylphthelate	SW8270	5	7/05	SE	SH.	m	9	3	
B: analyte detected in blank J: estimated value, below quantification limit f:	bis(2-Ethylhexyl)Phthalate	SW8270	2	7	S	SE	m	=	2 2	
B: analyte detected in blank J: estimated value, below quantification limit f:	MOTEN. Beaulte reported for	r detected	analytes o	اران مالا.		1 6 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1		
J: estimated value, Delow quantification (imit	NT: analyte not tested					analyte dete	cted in bla	Ę,	4	
The state of the s	ND: analyte not detected.		•				lue, below	QUANTITICAT	ושון וייםן	

MT: analyte not tested
MD: analyte protected in blank
MD: analyte not detected.
MS: No standard criteria or action level currently exists.
D: field blank (ambient condition blank)
R: resample
(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2

BEALE AFB: MATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 2

				Standards, C	Criteria Levels (a)	2-6-164	2-A-1GU	2-8-1GU	2-8-2GU	2-8-3GU	7-8-7C
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0647 09/15/89	BAFB-0646 09/15/89	BAFB-0648 09/15/89	BAFB-0638 09/12/89	BAFB-0658 09/19/89	BAFB-0652 09/18/89
Specific Conductivity	£120.1	1.0	Lambos/ca	NS	906	257	228	330	267	570	546
Temperature	E170.1	4/ H	O Geo G	SE	SH	19.0	19.0	19.0	19.5	19.5	19.0
. 3	E150.1	N/A	3	2-9	SE	7.46	7.28	7.17	7.36	7.29	7.29
Alkalinity - Total	SPK 03	1.0	1/0	2	SN	95.8	76.6	70.6	59.6	9.66	92.0
Bicarbonate	SH4 03	1.0	1 / 2	SN	SN	113.2	93.5	1.98	72.7	121.5	112.2
Total Dissolved Solids	E160.1	3.0	7	200	500 200	293	267	74	%	8	280
Chloride	E325.3	1.0	<u> </u>	250	250	16.0	18.0	26.0	20.0	0.69	20.0
Fluoride	E340.2	0.050	<u>}</u>	~	1.4	0.18	0.14	0.11	0.10	2	0.14
Mitrate + Mitrite	E353.3	0.050	7/0	1 0	45	20.1	16.6	28.8	25.4	20.9	19.9
Sulfate	E375.4	1.0	7	220	250	11.0	15.0	53.0	35.0	123	17.0
Cyanide	St.9010	0.0100	1/0	S¥	SN	9	0.0200	2	욮	皇	9
Calcium	Sta6010	1.00)	SN	NS	22.4	19.8	29.3	21.8	59.9	20.7
Iron	SW6010	0.100	7/2	ĸ.	ĸ.	0.351	2	2	2	욮	윷
Magnesium	Sta6010	.8	1/0	SE	N	12.9	12.6	19.1	14.6	33.3	13.0
Manganese	Su6010	0.0150	7	ક	9.	₽	0.000	2	2	윷	유
Potassium	Sta6010	1.00	~/2	S¥	SZ	1.70	1.30	1.10	S	웆	1.30
Sodium	Stu6010	9.1	7/2	SE	SE	11.4	9.54	12.3	11.2	19.2	11.6
Toluene	SMB020	_	- - - -	14,300	9	9	-	2	2	웊	2
Phenol	SMB270	5	7/25	S	SN	2	2	22	욮	Q	유
N-Nitrosodiphenylamine (1)	Su6270	5	7	W	SH	⊋	9	•	9	€	7 5
bis(2-Ethylhexyl)Phthalate	SMB270	2	7	SN	SE	15	9	22	욮	2	58
WOTES: Results reported for detected analy	detected	analytes only.	×14.					* * * * * * * * * * * * * * * * * * *			

NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l B: analyte detected in blank J: astimated value, below quantification limit b: field blank (ambient condition blank) MD: analyte not detected. MT: analyte not tested

e: equipment wash blank f: field replicate R: resample

TABLE 4.1.2-2 (continued)

Parameter					. ,		:		
		Detection				BAFB-0653	BAFB-0654	BAFB-0655	
	Method	Limit	Units	federa!	State		09/18/89		
Specific Conductivity	E120.1	: -	Lambos/cm	SN	006	5,46	=	2	4 4 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
	E170.1		deg C	SE	SE	19.0	I	Ħ	
	E150.1	W/W	*	2-9	SN	7.29	H	1	
Alkalinity - Total	SPK 03	1.0	7/ Das	50	SN	82.0	*	12	
	SPK 03	1.0	1/0	SE	SE	100.0	7	H	
lved Solids	£160.1	3.0	1/04	200	200	277	18.0	12	
	E325.3	1.0	/04	250	250	20.0	욮	H	
	E340.2	0.020	1/04	7	1.4	0.12	2		
+ mitrite	£353.3	0.050	/	10*	45	20.2	욮	T.	
	E375.4	1.0	7	250	220	17.0	2	H	
Colcium	Su6010	9.1	1/8	SX	SE	21.3	2	T.	
Magnesium	Su6010	. .	7/0	SZ	SE	13.6	2	H	
	Su6010	9.	/	SE	SH	1.20	₽	Ħ	
	Su6010	.0	1/0	S	SH	11.6	ş	H	
Methylene chloride	Sw8010	ب	1/80	SN	S#	욡	13(14)	4700(1800)	
	SMB020	-	/80	14,300	001	9	2(2)	9	
sodiphenylamine (1)	Su6270	10	7/60	N.	SN	윭	'n	L	
	SIMB270	2	1/60	SE	S	2	•	TN P	
NOTES: Results reported for detected analytes only.	etected a	malytes or	الا		; ; ; ; ;	· · · · · · · · · · · · · · · · · · ·	; ; ; ;	 	
MT: analyte not tested		•	•		B: analyte detected in blank	cted in blar	¥	• • • • • • • • • • • • • • • • • • •	e: equipment wash blank
NO: Mo standard criteria or action level	orion les		currently exists	ב ב	estimated value, below quantification timit	cue, perous	dition bla	ושוו יאני קלי	T: Theid replicate P: recemple

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.2-2

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 2

Parameter				and Action	Levels (a)	2-C-1GW	2-A-16W	2-R-1GW	2-R-26W BAFR-0723	2-R-3GW RAFR-0724	2-R-4GW RAFR-0712
	Method	Limit	n Units	Federal	State	11/27/89	11/27/89	11/30/89	11/30/89	11/30/89	11/28/89
Specific Conductivity	E120.1	1.0	Carrios/cm	:	8	546	:	330	250	!	
Temperature	E120.1	V/M	dea C		SN	18.0		19.0	19.0		
	£150.1	4/ 2	7	2-9	SH	7.40	7.00	7.28	7.30	7.24	7.35
Atkalinity - Total	504603	1.0	1/02	2	SX	76.8		80.0	73.4		
Bicarbonate	204403	1.0	7	SE	SE	93.7		9.76	89.5		
Total Dissolved Colide	F160.1		\ \ \ \ \	200	200	187		787	243		
Chloride	E3.25.1	1.0	7	250	250	16.9		56.6	20.3		
Flioride	F340.2	0.050	<u> </u>	7	1.4	0.20		0.16	0.17		
Mirrare + Mirrire	E353.3	0.050	ž	101	45	21.0		29.5	56.9		
	F375.4	1.0	1/0	250	250	11.5		49.5	33.2		
	5106010	00	1/0	SZ	SE	21.4		30.8	22.6		
	Su6010	1.00	<u> </u>	SE	SH	12.8		19.3	14.7		
Manaprese	SW6010	0.0150	2	.05	50.	2		욮	윷		
Potassin	SW6010	1.00	<u> </u>	SE	SE	1.17		1.56	웊		
Sodiu	SW6010	.0	- /o <u>r</u>	SE	SH	12.3		13.8	11.7		
Diethylchthalate	SW8270	1	1/20	SX	SN	3 7	_	87 87	9		
M-Nitrogodiphenylamine (1)	SW8270	5	1/95	SH	SN	9	_	8 13	Ξ		
Di-n-Rutylphthalate	SUB270	2	1/95	S#	SZ	•	_	8 12	О -		
bis (2-Ethylhexyl)Phthalate	SW8270	2	1/80	SH	SH	eo		욡	28		

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. NT: enalyte not tested ND: enalyte not detected.

MS: No standard criteria or action level currently exists.
b: field blank (ambient condition blank)
R: resample
(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix 1.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

boring samples collected under the sludge pits or near the abandoned injection wells. Table 4.1.2-3 presents the range of contaminants encountered for each of the media sampled (sludge, soil, groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. In some cases these detections may represent laboratory "noise" and the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank. Occasionally, the detection limits are higher than the contract LOQ due to required dilutions or analytical interferences. In these cases, the J qualifiers are applied to the actual achieved laboratory detection limits noted on a sample-specific basis in Appendix A.

4.1.2.2 Sampling and Analytical Problems

4.1.2.2.1 Loss of Samples

There were no sample loss problems for Site 2 samples. A total of eleven soil samples were resampled due to missed holding times. Four surface soil samples were resampled for volatile organics (8240), and seven soil boring samples were resampled for semivolatile organics (8270). In addition, two TFH-gas analyses were not completed due to laboratory handling problems. The omission of these two analyses is not considered critical to the final evaluation of site conditions.

4.1.2.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil and water samples collected at Site 2 contained several organic compounds that were probably laboratory or field induced false positive results. Many of the soil samples collected contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks.

Table 4.1.2-3
RANGES OF CONTAMINANTS DETECTED AT SITE 2

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
SLUOGE SAMPLES				
mercury	mg/kg	ND	0.14	1/6
cyanide	mg/kg	18.6	638	6/6
silver	mg/kg		53.5	6/6
chromium	mg/kg	43.7	326	6/6
toluene	mg/kg	ND	1.1	2/6
tetra dioxins	mg/kg	0.0017	0.0017	1/1
penta dioxins	mg/kg	0.019	0.019	1/1
nexa dioxins	mg/kg	0.076	0.076	1/1
nepta dioxins	mg/kg	0.580	0.580	1/1
octa dioxins	mg/kg	1.070	1.070	1/1
tetra furans	mg/kg	0.0013	0.0013	1/1
penta furans	mg/kg	0.012	0.013	1/1
nexa furans	mg/kg	0.038	0.038	-
nepta furans	• •	0.190	0.190	1/1
octa furans	mg/kg			1/1
octa furans	mg/kg	0.380	0.380	1/1
SURFACE SOILS				
:yanide	mg/kg	2.6	48.7	8/8
ilver	mg/kg	ND	11.6	4/8
chromium	mg/kg	24.8	48.1	8/8
ead	mg/kg	ND	151	1/8
toluene	mg/kg	ND	(0.55)	7/8
ois(2-ethylhexyl) phthalate	mg/kg	ND	0.83	1/8
SOIL BORINGS				
yanide	mg/kg	ND	4.5	6/39
FH-qas	mg/kg	ND	240	3/39
chromium	mg/kg	23.1	66.0	39/39
ead	mg/kg	ND	29.4	1/39
oluene	mg/kg	ND	0.82	
richloroethene				33/39
ois(2-ethylhexyl) phthalate	mg/kg	ND	0.033	5/39
ii-n-butyi phthalate	mg/kg	ND	0.13	6/39
?-butanone	mg/kg	ND	0.48	4/39
	mg/kg	ND	0.041	2/39
rnitrosodiphenylamine	mg/kg	ND	(0.67)	5/39
chloroform	mg/kg	ND	0.013	1/39
enzene	mg/kg	ND	0.012	1/39
ROUNDWATER				
oluene	ug/l	ND	38	6/24
richloroethene	ug/l	ND	2	1/24
phenol	ug/l	ND	22	3/24
is(2-ethylhexyl) phthalate	ug/l	ND	28	8/24
cyanide	mg/l	ND	0.03	U/ E4

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\label{eq:logical_problem} % \begin{subarray}{ll} \end{subarray} % \begin{subarray}{ll} \end{subarra$

Several soil samples contained the semivolatile compounds bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and N-nitrosodiphenylamine. Di-n-butyl phthalate was also detected in the method blank. The phthalate compounds were commonly detected in samples from throughout the base and are probably false positive results.

Phenol was detected in 14 surface soil samples (2-C-ISS to 14SS) at concentrations ranging from 2.0 mg/kg to 3.3 mg/kg and at 0.83 mg/kg in the 0- to 1.5-foot sample at boring 2-C-7SB. This has been traced to a factory contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Toluene was detected in most of the soil samples at low concentrations. This occurred for samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is a false positive result.

Chromium, iron, and zinc, among other metals, were detected in soil samples. For a few soil samples, chromium, iron, and zinc were also detected in the associated method blank. Zinc was detected in the blanks for surface soil samples 2-C-4SS and -6SS. Iron and chromium were detected in the blanks for all depths from soil boring 2-C-3SB and from 5 through 20 feet from soil boring 2-C-4SB. This does not mean, however, that these metals should be considered false positive results for these samples. They are naturally occurring metals that were consistently found in soil samples at higher concentrations than detected in the blank.

Six soil replicate QC samples were collected at Site 2. The replicate analyses were very comparable, with a few exceptions. The replicate of sludge sample 2-C-ISS had high RPDs for cyanide (92 percent), silver (56 percent), mercury (35 percent), and zinc (66 percent). This may be a reflection of true variability in the waste materials. A replicate sample in soil boring 2-C-4SB, at a depth of 25 feet, had a much higher moisture content than the replicate sample. Most metals were also higher in the original sample, as was TCE, which had an RPD of 138 percent. This variability is probably a reflection of a change in geologic materials between the first and second semple.

A replicate QC sample, plus an equipment wash blank and ambient condition blank, were collected at well 2-C-l in the first quarter. The replicate analysis results were almost identical to the original sample. The compound bis(2-ethylhexyl) phthalate was tentatively identified below the LOQ in the equipment blank. The ambient condition blank was free of contaminants.

In the second quarter groundwater sampling round at well 2-C-1, chloroform was detected at 3 ug/l in the equipment wash blank and in the ambient condition blank. Toluene was also detected in the ambient condition blank at 6 ug/l. As neither of these compounds was detected in the normal environmental sample or the field replicate, it is likely that these are false positive results or due to contaminated blank water.

In the third quarterly sampling at well 2-R-4, methylene chloride was not detected in the normal environmental sample or the replicate sample. However, methylene chloride was detected in both the ambient condition blank at 4,700 ug/l (1,800 ug/l in second column) and the equipment wash blank at 13 ug/l (14 ug/l in second column). This has been traced to contaminated Type 1 organic free water, which occurred in a number of blanks during the third sampling round. In each case, the normal environmental sample did not contain methylene chloride but the blanks did.

In the fourth quarter sampling Di-n-butylphthalate was detected in the method blank for all samples. Diethylphthalate was tentatively identified below the LOQ and in the method blank for 2-A-1, 2-C-1 and 2-R-4. N-Nitrosodiphenylamine was detected in the sample and the method blank at 2-A-1 and 2-R-4, and was tentatively identified below the LOQ in 2-C-1 and at the LOQ in the method blank.

4.1.2.2.3 Analytical Results Obtained under Out-of-Control Conditions

In the second quarterly sampling round, the 8270 analysis for well 2-C-1 had a 2,4,6-tribromophenol surrogate spike recovery of 150 percent which exceeded the acceptable range of 10 to 123 percent. For well 2-R-1 the p-terphenyl-d14 surrogate spike recovery was 27 percent which is below the acceptable range of 33 to 141 percent.

In the third quarterly sampling round, the 8010 analysis for well 2-R-2 had a bromochloromethane surrogate spike recovery of 141 percent and well 2-R-3 had 153 percent. Both of these exceeded the acceptable range of 70 to 130 percent. The 8270 analysis for well 2-R-4 equipment wash blank had a phenol-d5 surrogate spike recovery of 100 percent which exceeded the acceptable range of 10 to 94 percent.

In the fourth quarterly sampling round the 8010 analyses for wells 2-A-1 and 2-C-1 had bromochloromethane surrogate spike recoveries of 132 and 144 percent, which exceeded the acceptable range of 70 to 130 percent.

4.1.2.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.2.3 Significance of Findings

Fourteen surface soil samples were collected at Site 2, at locations shown in Figure 4.1.2-8. Three sediment samples were collected from each sludge pond and eight near the PWTP equipment pad. It was anticipated that the sludge ponds, where PWTP suspended solids are discharged and allowed to settle, would contain the highest concentration of contaminants because of the presence of waste sludges. The area adjacent to the PWTP was considered a splash area where fluids from the treatment process may have leaked or spilled during plant operation. Potential contaminants were expected here also, although at lesser concentrations.

Sediment

Cyanide and silver were detected in sediment samples from the sludge ponds. Mercury was detected in only two samples (2-C-ISS and its field replicate; see Figure 4.1.2-8). Cyanide was detected in 2-C-ISS to 2-C-6SS at concentrations of 18.6 to 638 mg/kg. Silver was detected in the sludge pond samples from 28.7 to 53.5 mg/kg. All metals detected were below respective DHS TTLC levels.

Dioxins and furans were also detected in one sample (2-C-6SS) randomly selected for that analysis. The only dioxin compound listed in the TTLC criteria is 2,3,7,8-tetrachlorodibenzo-p-dioxin (tetraCDD). The detected concentration of total tetraCDD isomers is 0.0017 mg/kg (1.7 ug/kg). The TTLC is 0.01 mg/kg. By the TTLC criteria, the sediment sampled is not a hazardous material.

An evaluation of toxicity equivalency was conducted to assess the approximate concentration of tetra through hepta isomer groups based on relative toxicity to 2,3,7,8 tetraCDD. The results are given in Table 4.1.2-4. Because analysis of individual dioxin and furan congeners (210 potential congeners) was not conducted, the concentration of 2,3,7,8 congeners within each isomer group was estimated. This was based on the total possible 2,3,7,8 congeners which could occur within each isomer group, assuming each congener has an equal possibility of occurring. For example, the hexaCDD isomer group has 10 congeners of which 3 are 2,3,7,8 isomers. Therefore, the detected concentration of 0.076 mg/kg (76 ug/kg), for hexaCDD is multiplied by 3/10 to obtain the estimated 2,3,7,8 congener concentration = 0.023 mg/kg (22.8 ug/kg).

Table 4.1.2-4

TOXICITY EQUIVALENCY OF DIOXIN AND FURAN ISOMER GROUPS

SEDIMENT SAMPLE 2-C-6SS - 0.0 TO 1.0 FOOT

Isomer Groups*	Detected ^b Concentration (ug/kg)	Estimated 2,3,7,8° Cogener Concentration (ug/kg)	EPA ⁴ TEF	CDHS*	EPA' RTC (ug/kg)	CDHS [®] RTC (ug/kg)
Furan Groups						
TetraCDF	1.3	0.03	0.1	1.0	0.003	0.030
PentaCDF	11.9	0.85	0.1	1.0	0.085	0.850
HexaCDF	38	9.50	0.01	0.03	0.095	0.285
HeptaCDF	194	97.00	0.001	0.03	0.097	2.910
Total CDFs	245.2	107.38			0.280	4.075
Dioxin Groups						
Tetra CDD	1.7	0.08	1.0	1.0	0.080	0.080
PentaCDD	19	1.36	¢ 5	1.0	0.680	1.360
HexaCDD	76	22.80	0.04	0.03	0.921	0.684
HeptaCDD	<u>583</u>	<u>291.50</u>	0.001	0.03	0.292	8.745
Total CDDs	679.7	315.73			1.973	10.869
TOTAL CDFs AND CDDs	924.9	423.11			2.253	14.944

^{*}Isomer groups analyzed. OctaCDD and OctaCDF were detected but are not part of toxicity equivalency evaluation.

Information in this Table derived from, "Chlorinated Dibenzo-P-Dioxin and Dibenzofuran Contamination in California from Chlorophenol Wood Preservative Use." Report No. 88-5WQ Division of Water Quality, State Water Resources Control Board, March 1988.

^{*}Concentration of dioxin and furan groups detected. Actual concentrations may be higher based on low spike recovery data.

Estimated concentration of 2,3,7,8 cogeners based upon possible number of 2,3,7,8 isomers within each isomer group.

⁴U.S. EPA Toxicity Equivalency Factor.

^{*}California Department of Health Services Toxicity Equivalency Factor.

U.S. EPA Relative Toxicity Concentration (Estimated 2,3,7,8 Cogener Concentration x EPA TEF).

^{*}California Department of Health Services Relative Toxicity Concentration (Estimated 2,3,7,8 Cogener Concentration x CDHS TEF).

The toxicity equivalency analysis was completed using both EPA and California DHS Toxicity Equivalency Factors (TEF). The total relative toxicity concentration (RTC) by the EPA method equals 0.002 mg/kg (2.253 ug/kg) for both dioxins and furans. The DHS method yields a relative toxicity concentration of 0.015 mg/kg (14.944 ug/kg) that is over seven times higher than the EPA method.

Caution should be used when applying the RTC results to decision making processes. The RTC results vary widely depending on assumptions made and methods used in the calculation.

Surface Soil

Cyanide and silver were detected in surface soil samples from the splash area adjacent to the PWTP. Cyanide was detected at concentrations of 2.6 to 48.7 mg/kg in all splash area samples. Silver was detected in the splash area samples from 4.8 to 11.6 mg/kg in four of the eight samples and not detected in the remaining four. The TTLC for silver is 500 mg/kg. By these criteria, none of the surface samples collected and analyzed represent hazardous waste.

Soil Borings

Barium, cadmium, copper, silver, and vanadium concentrations in the soil samples from the angled borings beneath the sludge ponds (see Figure 4.1.2-11 for schematic) compare closely with those detected in samples from the Site 2 background soil boring (cadmium and silver not detected in any borings), indicating that metals are probably not leaching into the soil from the sludge ponds. The absence of silver in these samples indicates that, though present in the photo waste stream and in surface samples from the sludge ponds, is probably not migrating through the soil.

TFH-gas was detected in soil samples from two borings at unrelated locations, as shown in Figure 4.1.2-9. The 40-and 50-foot samples from 2-C-ISB, near abandoned Injection Well No. 1, had TFH-gas concentrations of 240 and 170 mg/kg. TFH-gas was detected in the 30-foot sample from 2-C-2SB at 60 mg/kg.

The ICP metal scan on soil samples from Site 2 generally detected metals at similar concentrations to those in background soil samples on base. However, thallium was more widespread in Site 2 samples than at other sites, although it occurred at concentrations similar to those in background borings on base. The thallium results were probably due to interference problems with the ICP analysis. Lead was detected in the 30-foot sample from 2-C-2SB at 29.4 mg/kg. Lead at this level in an isolated location may be naturally occurring, or a false positive, with no relation to the

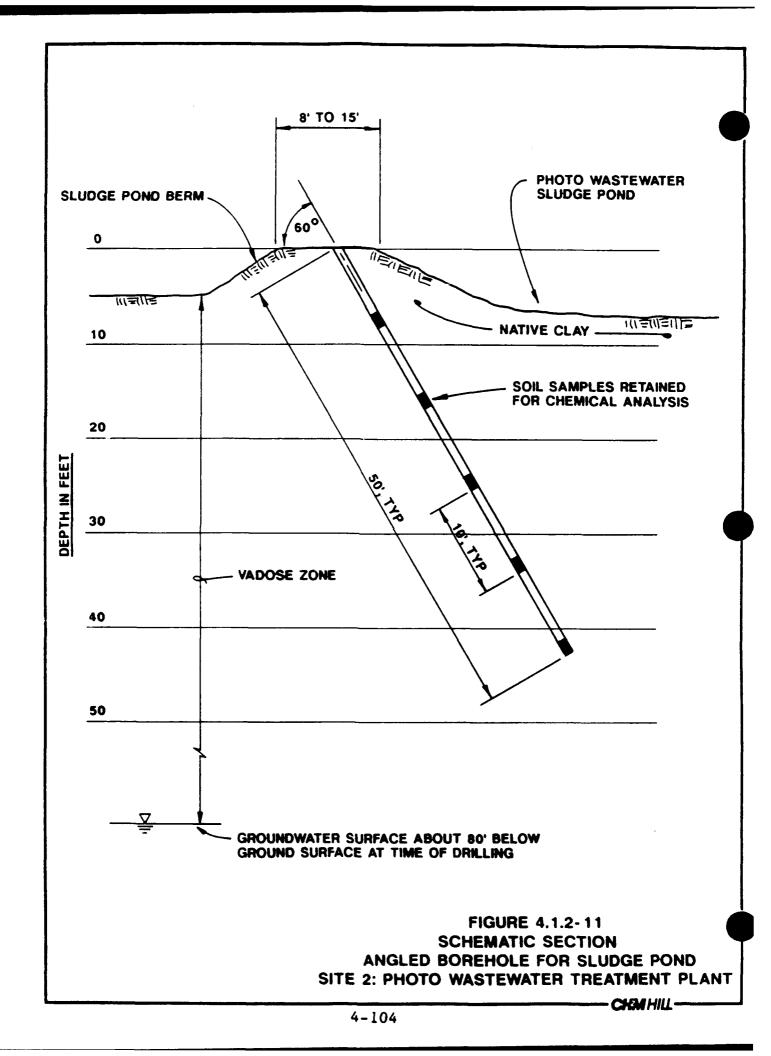


photo waste stream. Lead was only detected in 1 of 31 background samples and that was 24.2 mg/kg from the 0- to 1.5-foot surface sample at the background boring at Site 3, the Fire Protection Training Area, where the lead in the background boring could be related to training activities at the site. Therefore, any reported detection could represent either contamination, natural variability or native materials, or a false positive result. The TTLC for lead is 1,000 mg/kg.

Separate analyses for mercury and cyanide were also performed on all soil samples from Site 2. Mercury was not detected in samples from any borings. Cyanide was detected in six samples from five borings at concentrations from 0.13 to 4.5 mg/kg, as illustrated in Figure 4.1.2-9. In 2-C-3SB and 2-C-4SB, near abandoned Injection Well No. 2, cyanide was detected in samples from 5, 10, and 25 feet at concentrations of 3.1, 0.16, and 0.13 mg/kg. Cyanide was detected at 4.5 mg/kg in the 10-foot sample from 2-C-2SB, near abandoned Injection Well No. 3. Cyanide was also detected in the 20-foot sample from 2-C-1SB, near abandoned Injection Well No. 1, at 2.0 mg/kg. The 27.5-foot sample (actual vertical depth equals 23.8 feet) from 2-C-6SB, beneath the western sludge pond, had a 0.13 mg/kg cyanide concentration at the LOQ. A TTLC for cyanide is not available.

All soil samples from Site 2 were analyzed for volatile organic compounds. TCE was detected in samples from 15-, 25-, and 26.5-foot depths in boring 2-C-4SB, near abandoned Injection Well No. 2, at 0.018, 0.033, and 0.006 mg/kg concentrations. The 26.5 foot sample is a field replicate of the 25-foot sample. The detection limit for TCE in these analyses was 0.006 mg/kg. The TTLC for TCE in soil is 2,040 mg/kg. By this criteria, the TCE concentrations detected at Site 2 do not constitute a hazardous waste.

Toluene was detected in samples from all borings. The 2-C-6SB 8.5-foot sample (actual vertical depth equals 7.4 feet) had toluene at 0.82 mg/kg, which was the highest detected toluene concentration at Site 2. It is possible that this represents an environmental impact, but at the concentrations observed, this cannot be confirmed. It is also possible that the toluene represents a false positive. The LUFT cleanup standard computed for samples containing toluene at Site 2 is 0.3 mg/kg.

Groundwater

Groundwater samples were collected and analyzed for four quarterly sampling rounds from five existing and one new monitoring well at Site 2 during the Stage 2-1 study. TCE was detected at 2 ug/l in the first round in both a normal environmental sample and a field replicate from 2-C-1, but was not detected in 2-C-1 or any other wells in the second,

third, and fourth rounds. This monitoring well is near abandoned Injection Well No. 2 and soil boring 2-C-4SB. The state drinking water standard MCL for TCE is 5 ug/l. Phenol was estimated to be 7 ug/l in well 2-R-l below the 10 ug/l LOQ in the first quarter, at 14 ug/l in the second quarter, and at 22 ug/l in the third quarter, but was not detected in the fourth quarterly sampling. Cyanide was detected in 2-R-4 at 0.0300 mg/l in the first quarter, at 0.0200 mg/l in the second quarter, and was not detected in the third or fourth quarters. Cyanide was detected in 2-A-l at 0.0200 mg/l in the first quarter, at 0.0400 mg/l in the second quarter, and 0.0200 mg/l again in the third quarter. Cyanide was detected in 2-R-2 at the 0.0100 mg/l LOQ in the second quarter. Cyanide was not detected in any fourth quarter samples.

4.1.2.3.1 Zones of Contamination

The soil contamination zones within the areas investigated during Stage 2-1 at Site 2 are the sludge ponds, the area adjacent to the PWTP, and soil near abandoned Injection Well No. 2.

Surface samples from the sludge ponds contained silver at concentrations above background levels but below TTLCs. Silver was not detected in any of the soil samples from the angled soil boring beneath each sludge pond, although chromium, iron, magnesium, vanadium, and zinc were detected at levels between four and five standard deviations above averaged levels for the metals from background soil borings on base. All detected metals were at concentrations below TTLCs.

Although soil borings were not drilled in the PWTP equipment pad area, analyte concentrations from surface samples in this area were generally less than those from sediment samples in the sludge ponds. The lack of similar analytes in samples from the angled borings at the sludge ponds indicates that metals or other compounds characteristic of photo waste probably have not migrated beyond the surficial soil.

PCP, though previously included in the waste stream as an antislime agent (Beale AFB, 1989), was not detected in any sediment or surface samples. Based on information from a sanitary treatment plant worker (Guerro, 1989) and system operation records (AeroVironment, Inc. 1987), an estimated maximum of 0.5 to 1 gallon of PCP per month was discharged onto the ground surface at each abandoned injection well head. The PCP was mixed with the 500 to 2,000 gallons of effluent discharged monthly at the well heads during the 18 years of this operation.

Although PCP was detected in one soil sample at abandoned Injection Well No. 2 in the Phase II, Stage 1 study, PCP was not detected in either boring near the abandoned injection

well in the Stage 2-1 study. The soil in areas adjacent to abandoned Injection Wells No. 1 and 3, based on soil sampled during the Stage 2-1 study, also show no signs of PCP contamination. PCP rapidly degrades with exposure to ultraviolet light and would not be expected to persist in the open environment (EPA, 1986). In water PCP is photochemically reduced to isometric tri- and tetrachlorophenols (EPA, 1986), although no evidence of these compounds were found. PCP also biodegrades due to microbial action. These unsubstantiated phenomena may have acted on PCP in effluent water when it was discharged onto the ground surface, or acted on PCP in the soil. Since no characteristic PCP breakdown compounds were detected, it is concluded that PCP and related compounds either do not currently exist at the abandoned injection well heads or the sampling locations missed localized PCP tainted soil.

Soil in one of two borings (2-C-4SB) near monitoring well 2-C-1 and abandoned Injection Well No. 2 contained TCE to the total depth sampled of 28 feet. The vertical extent of TCE could not be determined because TCE was detected in the deepest soil sample, albeit the TCE concentration at the 28-foot sample depth (56 feet NGVD) was the lowest in the boring. The source of this TCE is not known. No records of TCE in the photo wastewater were found.

In groundwater, phenol was detected in the first three sample rounds at well 2-R-1. Cyanide was detected in the first two of three rounds at well 2-R-4, in the first three rounds at 2-A-1, but only in the second round at well 2-R-2. Cyanide was not detected in the fourth round. These chemicals may represent an environmental impact at these locations. The extent of impact is unknown.

4.1.2.3.2 Contaminant Migration

Metals characteristic of the photo wastewater detected in the surface samples at the sludge ponds, surface samples from near the PWTP, and soil samples from borings at abandoned Injection Wells No. 1 and 3 are apparently not migrating, based on information collected during the Phase II, Stage 1 and Stage 2-1 studies. Metals detected in the sediment samples from the sludge ponds were not detected in the soil borings beneath the ponds. Evidence of migration of metals through the clay deposits at Site 2 was not detected in the Stage 2-1 study. Such migration of metals is not expected at Site 2.

TCE detected in the soil boring 2-C-4SB near abandoned Injection Well No. 2 may be migrating towards the groundwater. TCE was detected at well 2-C-1 in the first but not in later sampling rounds. TCE in the soil cannot be concluded to be the sole source of the TCE in the groundwater. TCE has been detected in soil and groundwater samples from Site 13 (soil

boring 13-C-2SB and all monitoring wells), at locations both cross-and downgradient from well 2-C-1 and boring 2-C-4SB (see Figure 4.1.13-1).

Hutchinson Creek is perched above the water table and is probably a losing stream. Therefore, water percolating through the soil would probably not flow into the creek, but vertically towards the groundwater table. Therefore contaminants in the soil at Site 2 probably will not be transported into the creek unless carried by surface runoff.

4.1.2.3.2.1 Potential to Move Off Site and Off Base

The potential for compounds in the soil to move either off the site or off the base is considered low unless these migrate to the groundwater.

The potential for TCE and cyanide detected in the ground-water to move off site and off base is considered high.

4.1.2.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Linear groundwater velocity can be roughly estimated using the equation v = Ki/n, where v = average linear groundwater velocity, K = hydraulic conductivity, i = groundwater gradient, and n = effective porosity. The hydraulic conductivity was estimated in the 72-hour test at well 19-C-4 to be about 28 feet per day. The regional groundwater gradient (i) in the vicinity of Site 2, taken from Plate 3, March 1989, Groundwater Elevations at Beale AFB, is about i = 0.007 foot per foot. The estimated effective porosity (n) for permeable sediments, through which groundwater will flow preferentially, is 20 percent (0.20). Using these value gives:

 $v = Ki/n = (28 ft/day \times 0.007/0.20) = 0.98 ft/day,$ or for a yearly value:

0.98 ft/day x 365 days/yr = 360 ft/yr

The direction of flow is generally to the northwest.

4.1.2.3.2.3 Time of Travel to Receptors

The nearest potential downgradient receptor is the off-base residence approximately 3,000 feet northwest of Site 2. Using only the average linear groundwater velocity, the estimated travel time for groundwater from Site 2 to the residence is approximately 8 years. However, many factors affect contaminant transport in groundwater, and most of these factors are not well defined in this project. Some of these factors act to shorten and some to lengthen the travel time of a contaminant in groundwater. This estimate does

not include any of the possible effects of dispersion, diffusion, adsorption, or chemical changes in the subsurface. A well at the residence has been sampled during the third and fourth sampling rounds. This sampling effort is presented in Section 4.1.13 with the Site 13 discussion.

4.1.2.3.2.4 Applicability of Solute Transport Models

Solute transport models may not be applicable at Site 2. Available data are not sufficient to support model assumptions or estimate unknown factors.

4.1.2.3.2.5 Expected Spatial and Temporal Variations in Concentration

Based on the irregular detections of TCE and cyanide in groundwater at Site 2, accurate estimates of spatial and temporal variations cannot be made.

4.1.2.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

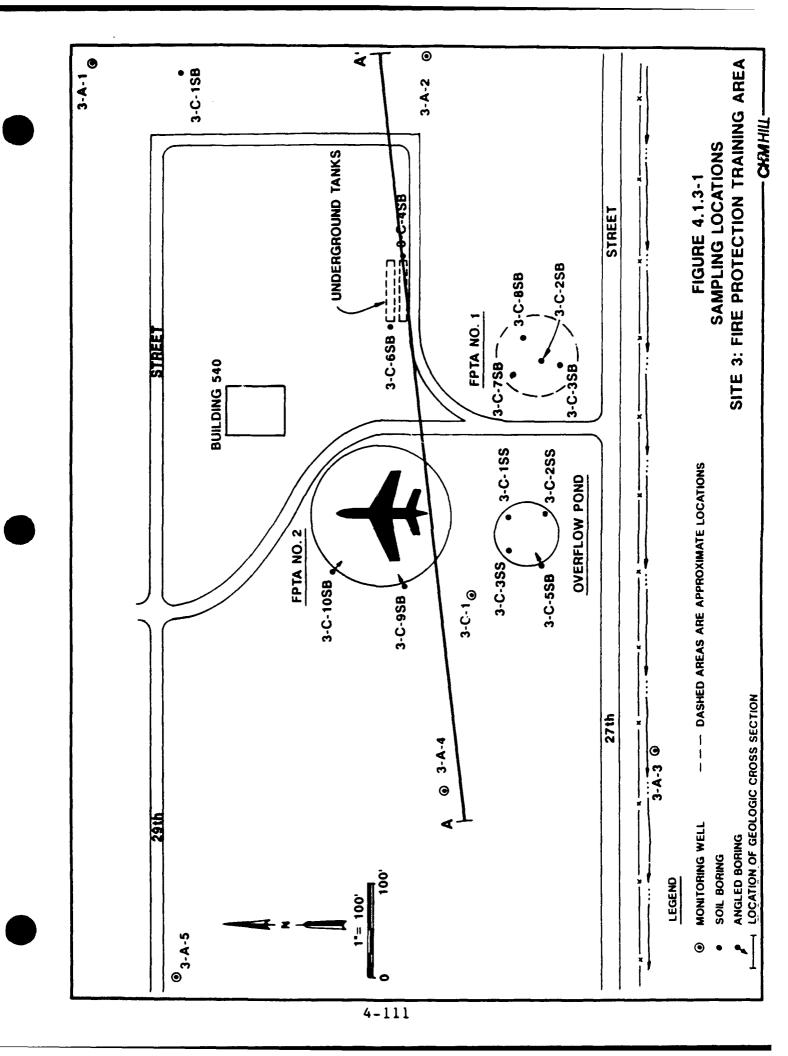
4.1.3 ISCUSSION OF RESULTS FOR SITE 3: FIRE PROTECTION TRAINI - AREAS

Training exercises have been conducted at Site 3 (Figure 4.1.3-1) in FPTA No. 1 and FPTA No. 2 since 1958. From 1958 to 1971, the fire department conducted live fire training exercises at FPTA No. 1. During this period, combustible waste chemicals were accumulated in a shallow 2-footdeep basin. These chemicals were reported to have included waste oils, spent solvents, and aviation fuel. These chemicals were burned weekly in the basin as part of fire training exercises. No volume estimate of chemicals used for exercises was available. The basin area did not have a liner, nor was there any preapplication of water to prevent the percolation of waste chemicals into the soil. The materials were applied directly to the soil and ignited (Engineering-Science, 1984). The Phase II Stage 1 investigation did not locate FPTA o. 1. FPTA No. 1, which is no longer visible to someone walking on the site, was located by inspecting aerial photographs (1973 and 1987) from the base civil engineering department. The aerial photographs were not of high enough quality to reproduce for this report.

FPTA No. 2, located about 200 feet northwest of FPTA No. 1, began operating in 1972 when use of FPTA No. 1 was discontinued. FPTA No. 2 consists of a shallow unlined basin 150 feet in diameter surrounded by a 12-inch berm. Inside the basin is a mock-up aircraft used for fire training exercises. Fire training exercises involve simulated fires in and around the mock aircraft. The unlined basin is flooded with water before exercises. The native clay surface soil allows the water to pond, minimizing infiltration. During and after exercises, the contaminated jet fuel used for fire raining floats on the water ponded in the mock-up basin. About 100 feet south of the mock-up is an unlined overflow basin designed to hold liquid drained from FPTA No. 2. Residual water and fuel are left in the overflow basin to evaporate.

Two 25,000-gallon underground storage tanks are located at Site 3. They are designated as the north tank and the south tank. The north tank contains jet fuel used by the base fire department for live fire training in the adjacent fire pit. The south tank has traditionally contained contaminated fuel, hydraulic fluid, and waste solvents. Underground fuel lines run from the tanks to the fuel nozzles at the mock-up in the fire pit.

Ten soil borings were drilled and sampled at Site 3: one vertical background boring, four vertical borings in the FPTA No. 1 area, two angled borings under FPTA No. 2, one



angled boring under the overflow basin, and two vertical borings near the underground tanks. Soil contamination was detected in samples from all borings except the background.

Three surface soil samples were collected from the overflow basin, and contaminants were detected in these samples also.

One new monitoring well was constructed during Stage 2-1. This and five existing wells were sampled during two semiannual sampling rounds. No contamination has been detected in any of the wells.

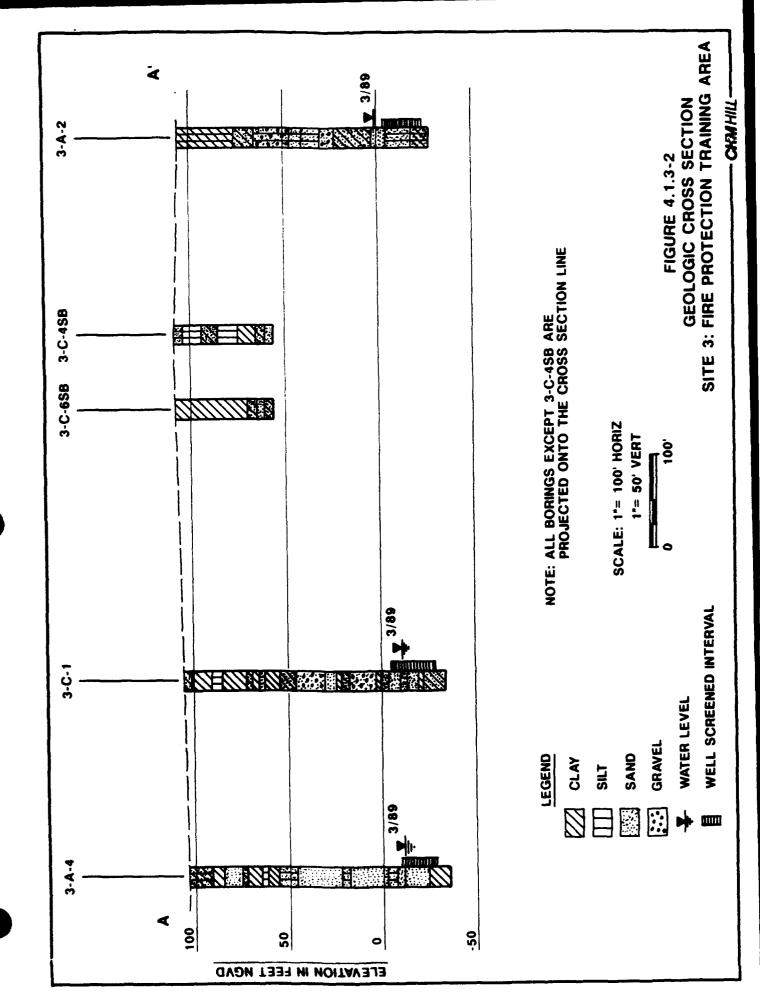
4.1.3.1 Presentation of Results

The following section presents the results of the field investigation at Site 3. The discussion focuses on the geology and hydrogeology at the site and presents the results of chemical analyses performed on samples of groundwater, surface water, and soils.

4.1.3.1.1 Site Geology

Evaluation of the geology at Site 3 is based on boreholes and wells drilled during the Stage 2-1 investigation and on wells installed during the Phase II, Stage 1 investigation (AeroVironment, 1987). During the current investigation, 10 soil borings were drilled at Site 3: one vertical background boring drilled to a total depth of 51.5 feet, four vertical borings in the FPTA No. 1 area drilled to total depths of 21.5 feet, two angled borings under FPTA No. 2 drilled to total depths of 49 feet (42 feet vertically), one angled boring under the overflow basin drilled 48.5 feet deep (42 feet vertically), and two vertical borings near the underground tanks drilled to total depths of 51.5 feet. In addition, one monitoring well was drilled between the FPTA and the overflow pond to a depth of 140 feet BGS (-34 feet NGVD). During the Phase II, Stage 1 investigation, five monitoring wells had been constructed at Site 3 and screened at or near the water table. The location of these wells and boreholes is shown in Figure 4.1.3-1. Soil boring logs are provided in Appendix D.

A cross section constructed from selected soil boring logs of Site 3 wells and boreholes is shown in Figure 4.1.3-2. A schematic of soil types encountered in shallow soil borings is presented in Figure 4.1.3-3. These figures show that near-surface soil in the vicinity of Site 3 is predominantly fine-grained, becoming increasingly coarse-grained with depth. The log of well 3-A-5 shows sand through almost the entire interval. The sand lies mainly below about 40-45 feet in depth (65-70 feet NGVD) on the eastern sides of the site, and below about about 50 feet in depth (50 feet



NGVD) on the south and west side of the site. All of the wells are screened in the sand units in unconfined groundwater. The bottom of each screen terminates in clay, which appears to form the basal boundary of the coarse-grained deposits.

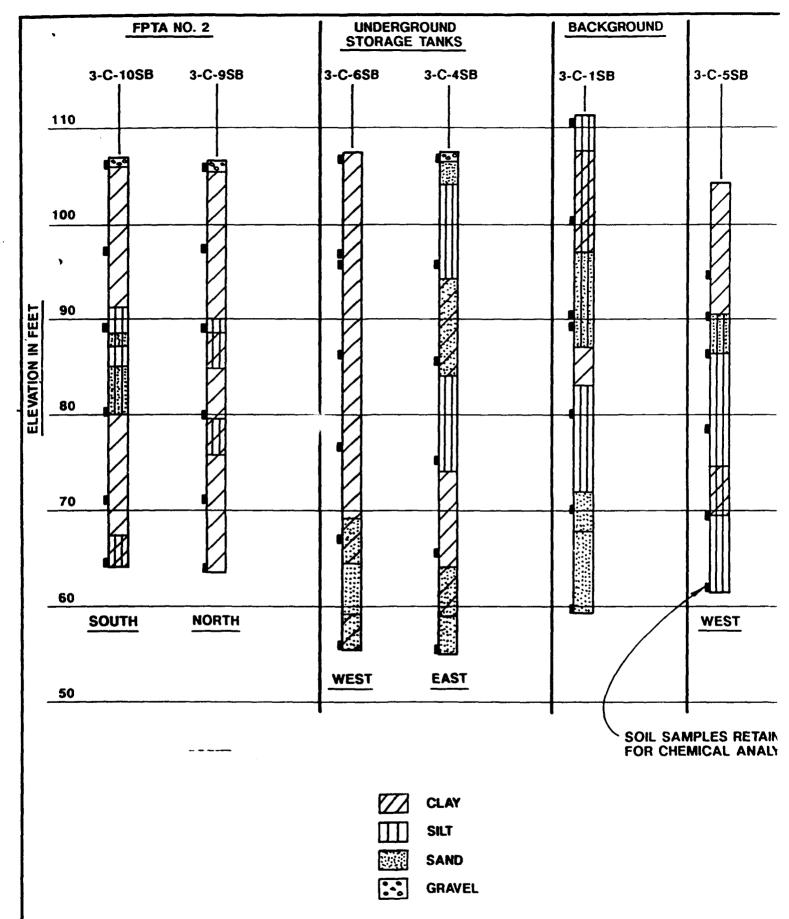
This clay lies at about 117 feet in depth (-5 feet NGVD) in well 3-A-1. The log suggests that the clay may be decomposed bedrock. The clay was encountered at about 122 feet in depth (-16 feet NGVD) in well 3-A-2. It lies deeper to the west, from about 124 feet in depth (-18 feet NGVD) in well 3-C-1 to about 142 feet in depth (-39 feet NGVD) in well 3-A-4.

Near-surface deposits at Site 3 constitute an alluvial sequence that has been mapped as belonging to the Laguna Formation (Page, 1980). These are continental alluvial deposits of the Pleistocene and Pliocene Epochs composed of silt, sand, clay, and gravel. These deposits overlie the older volcanic rocks from the Sierra Nevada in the stratigraphic section at Beale AFB. The volcanic rocks outcrop about 1 mile east of Site 3 in the foothills (Page, 1980). Based on the colors described in the logs of the boreholes, no volcanic material was encountered at Site 3 with the possible exception of the basal clay. This clay may be the weathered product of the volcanic sediments.

4.1.3.1.2 Site Hydrogeology

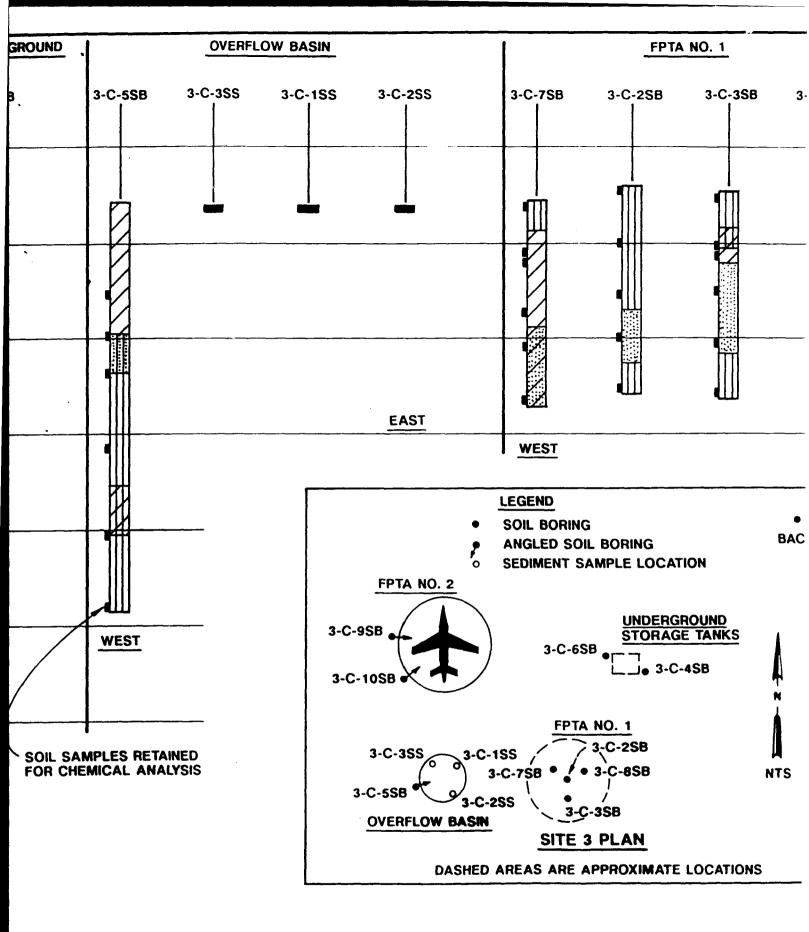
The first saturated permeable zone in well 3-C-1 occurred at about 119 feet in depth (-13 feet NGVD) as the bit entered a coarse sand unit. After completion and development of this well, the water level stabilized at about 118 feet in depth (-12 feet NGVD). It is likely that the groundwater is unconfined in the coarse, poorly graded sand and the silty sands that overlie the coarse sand. The sands are underlain by a fat clay at about 124 feet BGS (-18 feet NGVD). Groundwater appears to be unconfined in all of the wells installed during the Phase II, Stage 1 investigation.

Groundwater levels in Site 3 monitoring wells between April 1986 and November 1989 together with screened intervals are summarized in Figures 4.1.3-4 and 4.1.3-5, and Table 4.1.3-1. This table shows that there has been a large rise in groundwater levels in wells 3-A-3, 3-A-4, and 3-A-5 on the western side of the site. In well 3-A-5 between April 1986 and November 1989, for example, the groundwater level rose over 14 feet. The groundwater level in well 3-A-4 rose



SCALE: HORIZ - NOT

1"= 10' VERT



SCALE: HORIZ - NOT TO SCALE

1"= 10' VERT

FIGURE 4.1.3-3
SOIL PROFILE
SITE 3: FIRE PROTECTION TRAIN

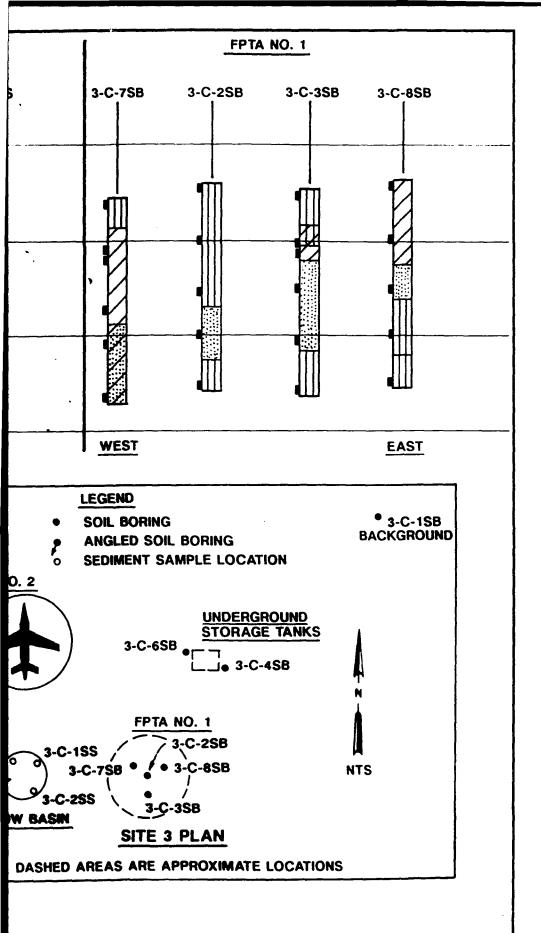
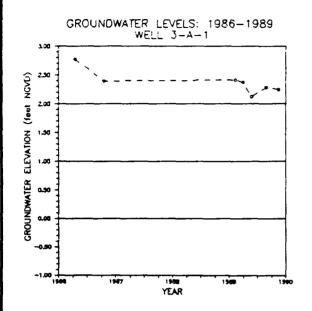
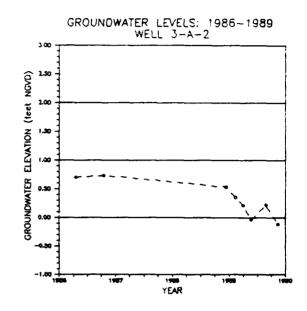
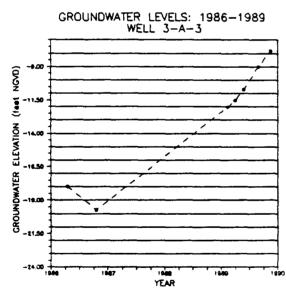


FIGURE 4.1.3-3
SOIL PROFILE
SITE 3: FIRE PROTECTION TRAINING AREA

CHEMIHIL-







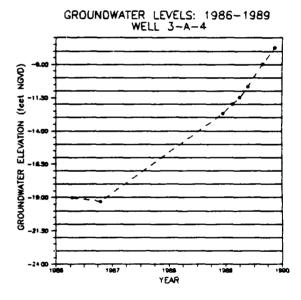
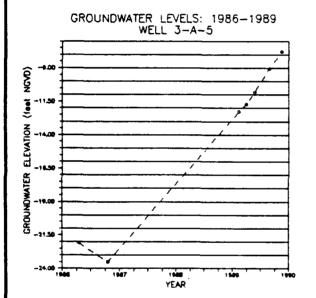
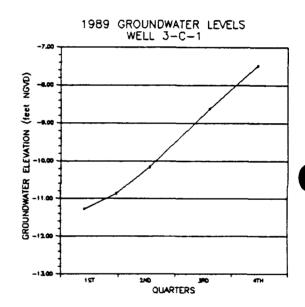


FIGURE 4.1.3-4

MONITORING WELL HYDROGRAPH
SITE 3: FIRE PROTECTION TRAINING AREA





NOTE: VARYING TIME SCALES

FIGURE 4.1.3-5

MONITORING WELL HYDROGRAPH
SITE 3: FIRE PROTECTION TRAINING AREA

Table 4.1.3-1
GROUNDWATER ELEVATIONS: SITE 3
(FEET NGVD)

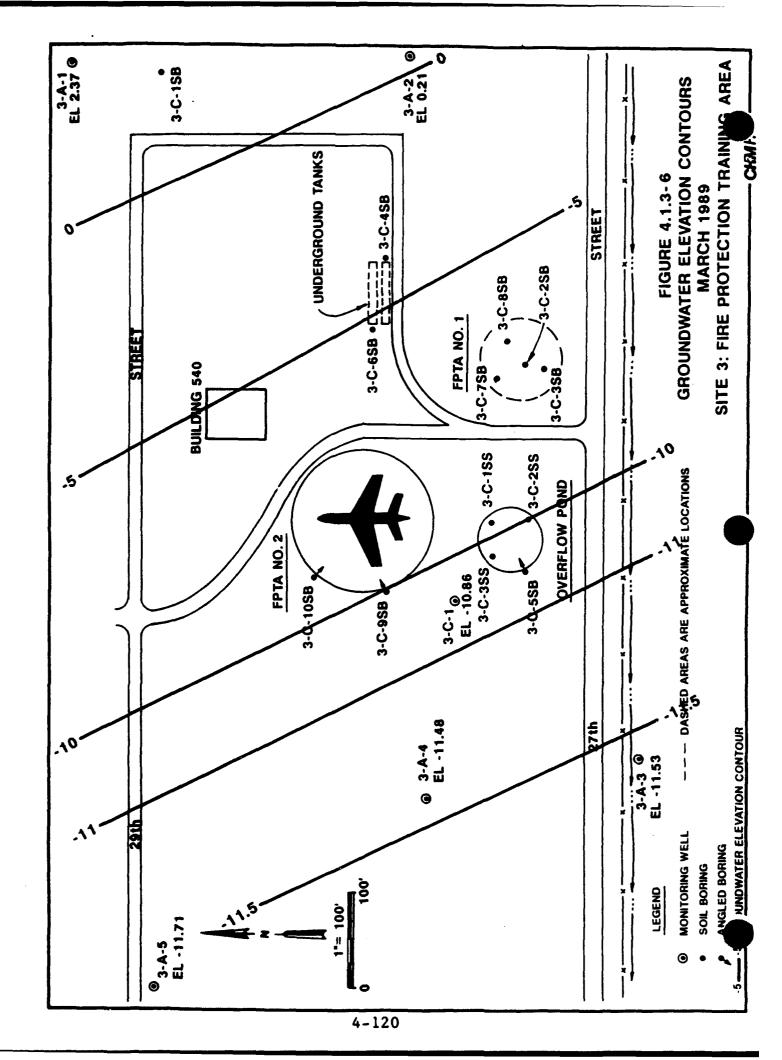
Well_	Screened Interval							
3-A-1	10 to -10	2.77	2.39	2.68	2.37	2.12	2.28	2.24
3-A-2	-3 to -23	0.70	0.73	0.61	0.21	-0.04	0.22	-0.12
3-A-3	-14 to -34	-17.97	-19.73	-12.15	-11.53	-10.71	-9.02	-7.82
3-A-4	-7 to -27	-18.91	-19.30	-12.13	-11.48	-10.66	-8.95	-7.73
3-A-5	-10 to -30	-22.08	-23.51	-12.24	-11.71	-10.83	-9.05	-7.79
3-C-1	-4 to -24		***	-12.41	-10.86	-9.95	-8.63	-7.49

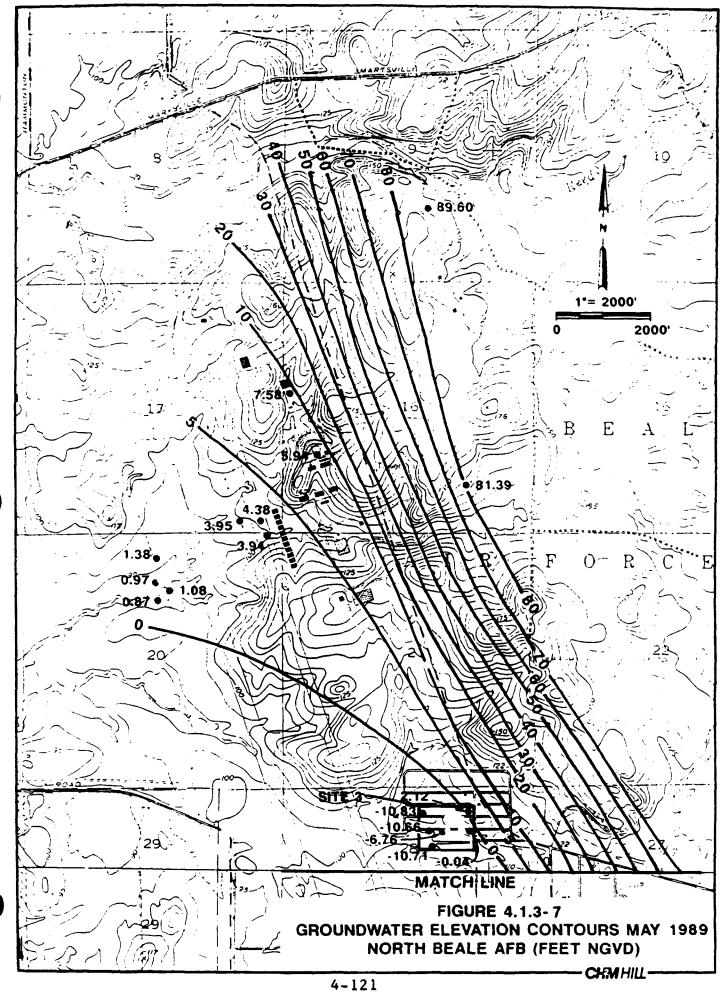
over 11 feet, while the level in well 3-A-3 rose over 10 feet. Groundwater levels in wells 3-A-1 and 3-A-2 actually declined less than a foot between 1986 and 1989. The pattern in these wells is typical of wells constructed on the east side of Beale AFB.

Groundwater levels from Site 3 monitoring wells in March 1989 are plotted on Figure 4.1.3-6. Plate 3 plots groundwater level contours based on elevations measured in March 1989 at Beale AFB, while Figure 4.1.3-7 plots similar data for May 1989 in the north area of Beale AFB. These figures show that in the vicinity of Site 3, groundwater is flowing to the southwest.

The groundwater level figures also show that the horizontal gradient increases sharply to the east of Site 3, across the geologic boundary between unconsolidated alluvium in the Central Valley and consolidated rocks in the foothills of the Sierra Nevada. According to Figure 4.1.3-6, the hydraulic gradient increases at Site 3 from about 0.003 on the west side of Site 3 to about 0.02 on the east side. The horizontal gradient west of Site 3 may not be accurately estimated because of the lack of data points.

The increase in hydraulic gradient and the difference in groundwater hydrographs suggests that two hydrogeologic regimes are present at Site 3. Wells on the west side of the site are completed in unconsolidated alluvium typical of the Central Valley. The rise of water levels in these wells





between 1986 and 1989 is probably part of the regional water level rise exhibited in the other wells located on the west side of Beale AFB. This rise is presumably due to a reduction in agricultural pumping west of the base or an increase in groundwater recharge or both. The hydraulic gradient in this alluvium is toward the groundwater depression west of Beale AFB.

The groundwater level on the east side of Site 3 is over 11 feet higher than on the west side (Figure 4.1.3-6). According to soil boring logs, wells 3-A-1 and 3-A-2 are completed in a purplish clay which is possibly decomposed bedrock. Overlying the clay is about 7 feet of purplish silty fine sand. Above this unit are brown sands that continue upward for 60-70 feet. Both wells are screened across the contacts among the sands and clay (AeroVironmers, 1987). Thus, groundwater may be flowing through or over a altered surface of a consolidated rock unit in wells 3-A-1 and 3-A-2. Water levels in wells 3-A-1 and 3-A-2 may therefore be dynamically perched on a zone of residual clay, flowing to the southwest down-dip above consolidated rock. Water level fluctuations in these wells may be more closely related to the availability of up-gradient recharge than to changes in the groundwater depression west of the base. Groundwater in wells 3-A-1 and 3-A-2 reflects the characteristics of a hydrogeological regime more typical of the foothills of the Sierra Nevada.

Aquifer parameters for the permeable zone screened by well 3-C-1 were derived according to the Cooper-Jacob Method (1946) from the water level data generated during a 3-1/2-hour drawdown and 3-1/2-hour recovery test. Plots of the data and a discussion of testing methodology are provided in Appendix E. These tests yielded an average value of transmissivity of 310 square feet per day, and an average hydraulic conductivity of 22 feet per day (7.8 x 10³ cm/sec.)

Water levels were monitored in well 3-A-4 during the test, but no change was observed. An estimated value of average interstitial groundwater velocity may be estimated by substitution into Darcy's Law. Assuming a hydraulic conductivity of 28 feet per day, as estimated in the 72-hour pump test in well 19-C-4, a hydraulic gradient of 0.003, and an effective porosity of 0.20, the estimated groundwater velocity is about 0.4 feet per day, or 150 feet per year.

4.1.3.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given with Appendix A and in Appendix F.

Discussion of analytical results in this and following subsections and presentation of analytical results in figures and tables are limited to results which are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.3.1.4 and in Appendix A.

Soil Samples

A total of 55 soil samples were collected from 10 soil borings: one background boring, four 20-foot borings in the area of FPTA No. 1, one angled boring beneath the overflow basin, two angled borings beneath FPTA No. 2, and two borings near the underground storage tanks. Three additional surface soil samples were collected from the overflow basin. These soil boring and surface soil samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method).

TFH-diesel was detected in all three surface soil samples and in 29 of the 55 soil boring samples at concentrations up to 23,000 mg/kg. Likewise, TFH-gas was detected in 26 of the soil samples up to 5,100 mg/kg, but not in any of the surface samples. TFH-diesel and -gas concentrations are shown in Figure 4.1.3-8.

Mercury was detected in 21 of the 55 soil boring samples above the 0.060 mg/kg LOQ, but not in any of the surface samples. Detected mercury concentrations ranged from 0.068 mg/kg to a maximum 0.58 mg/kg. Mercury concentrations are shown in Figure 4.1.3-8.

Lead was the only ICP metal detected at levels above the range observed in other soil samples on base. Lead was detected in all three surface samples, and in 5 of the 55 soil samples. Lead generally occurred at levels above the LOQ in near surface soil samples from borings in FPTAs No. 1 and No. 2. The highest detected lead concentration was 534 mg/kg, in the FPTA No. 1. Lead was also detected in the 0- to 1.5-foot sample in the background boring, which was the only lead detected in any background sample at Beale AFB. Detected lead concentrations and locations are shown in Figure 4.1.3-9.

Nine volatile organic compounds were detected at levels above the LOQ in surface samples and soil borings at Site 3: total xylenes, benzene, TCE, 1,2-DCE, and trans-1,2-DCE, toluene, 2-butanone, tetrachloroethene, and ethylbenzene. The concentrations of the first five of these compounds are illustrated in Figure 4.1.3-10. One or more of the former

volatile organics were detected at various depths in borings 3-C-2SB, 3-C-7SB, and 3-C-8SB in FPTA No. 1; in 3-C-10-SB at FPTA No. 2, in 3-C-5-SB at the overflow basin, and in 3-C-4SB at the underground storage tanks.

Two semivolatile organic compounds were detected in surface soil samples at levels above the LOQ. Bis(2-ethylhexyl) phthalate was detected in all three and di-n-butyl phthalate in one of the three surface soil samples. However, these phthalate compounds are ubiquitous in soil samples basewide and in the laboratory and may represent false positives.

Four semivolatile compounds were detected in samples from the soil borings at levels above the LOQ. Di-n-butyl phthalate, 2-methylnaphthalene, 4-methyl 2-pentanone, and naphthalene were detected in 6, 9, 3, and 5 of the 55 soil samples, respectively. The 2-methylnaphthalene and naphthylene concentrations are shown in Figure 4.1.3-9. Bis(2-ethylhexyl) phthalate and phenanthrene were detected in four and two samples, respectively, at levels below the LOQ.

Groundwater Samples

In the two semiannual rounds of water sampling at Site 3, groundwater samples have been collected from each of six monitoring wells (five existing, one new). Analyses performed for water samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7421), mercury (7470/7471), selenium (7740), water quality parameters, and TFH-diesel and -gas (California method).

TFH-gas, toluene, and bis(2-ethylhexyl) phthalate were the only potential contaminants detected in the first semi-annual round groundwater samples from Site 3. TFH-gas was 0.10 mg/l in the 3-C-l first round replicate sample. Toluene was detected at levels up to 6 ug/l in three of the six samples, but was also detected in the field blank. Bis(2-ethylhexyl) phthalate was detected at 10 ug/l in 3-A-1. Arsenic was detected in 3-A-2 at 0.011 mg/l and vanadium at 0.069 mg/l.

TDS varied from 256 mg/l to 305 mg/l in the first round groundwater samples at Site 3. The minimum TDS was measured in 3-C-l (replicate) and the maximum in 3-A-4. Water type varies from sodium-calcium bicarbonate to calcium-sodium chloride-bicarbonate. Site 3 background wells 3-A-l and 3-A-2 have higher milliequivalent percentages for sodium (46 and 51 percent) than other areas at Beale AFB. Nitrate plus

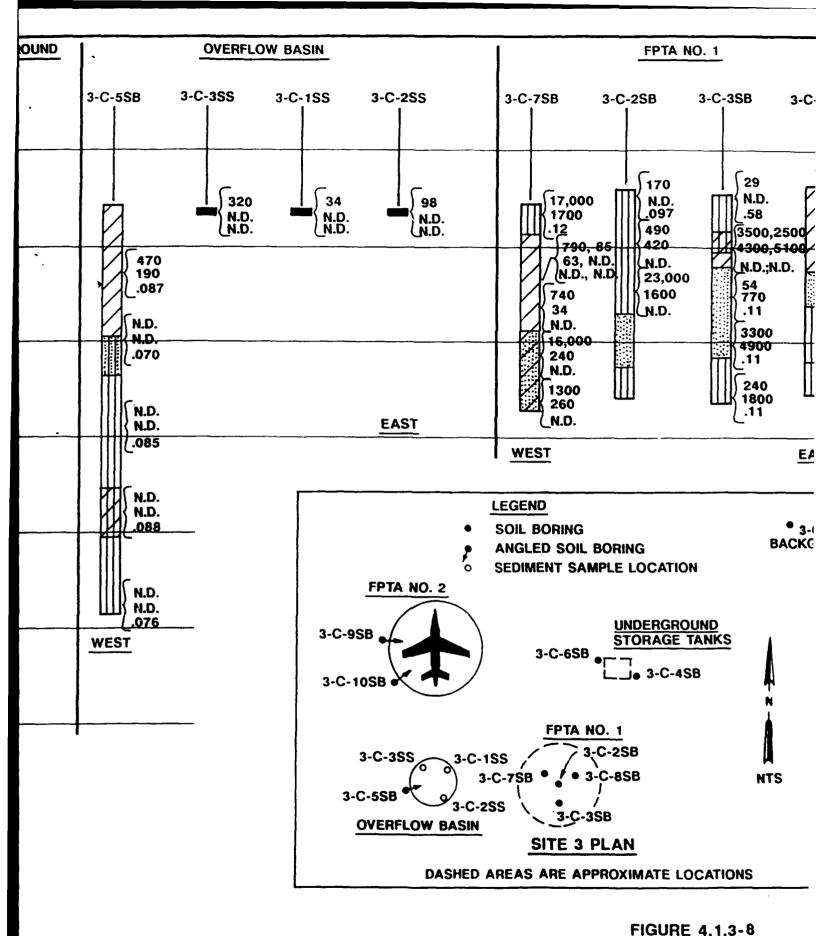
	•	FPTA I	10. 2	UNDER	RGROUND GE TANKS	BACKGROUN	ID
		3-C-10SB	3-C-9SB	3-C-6SB	3-C-4SB	3-C-1SB	3-C-5SB
	110					<u> </u>	
		2700 330 N.D.	940 140 N.D.	N.D N.D .17	· 53 1700		
	100						
	,	N.D. 39 N.D.	8.8 N.D. N.D.	I V K 600	, 630 \[\begin{aligned} \ 1800 \\ 240 \\ \ .085 \end{aligned}	La suma de la companya de la company	470 190 .08:
EET	90	9400	111200	1/2			N.D.
ELEVATION IN FEET		700 (N.D.	N.D. N.D.	5.1 N.D .15	N.D. 47 .076		(.070 N.D.
LEV	80						N.D.
				280 150 .093	IIIK 44		N.D.
	70	4-	-1/	1/2	— —		N.D. 380.
				/ 180 72 2 .091			N.D.
	60	COUT	NORTH				∭ N.D. .07€
		SOUTH	NORTH	4	N.D. 38 .068		WEST
	50			WEST	EAST		

LEGEND

TFH - DIESEL ; FIELD REPLICATE TFH - GAS ; FIELD REPLICATE MERCURY; FIELD REPLICATE		CLAY SILT SAND GRAVEL
N.D. NOT DETECTED N.D.* CONCENTRATION ESTIMAT NOTE: ALL VALUES ARE IN mg/K CONCENTRATIONS SHOWN ONLY ANALYTE WAS ESTIMATED OR DI WERE SAMPLED OVER THEIR EN	9 WHERI ETECTE	E AN INDICATED

SCALE: HORIZ - NC

1"= 10' VEF



SCALE: HORIZ - NOT TO SCALE 1'= 10' VERT TFH-DIESEL, TFH-GAS, AND MER SOIL SAMPLES

SITE 3: FIRE PROTECTION TRAININ

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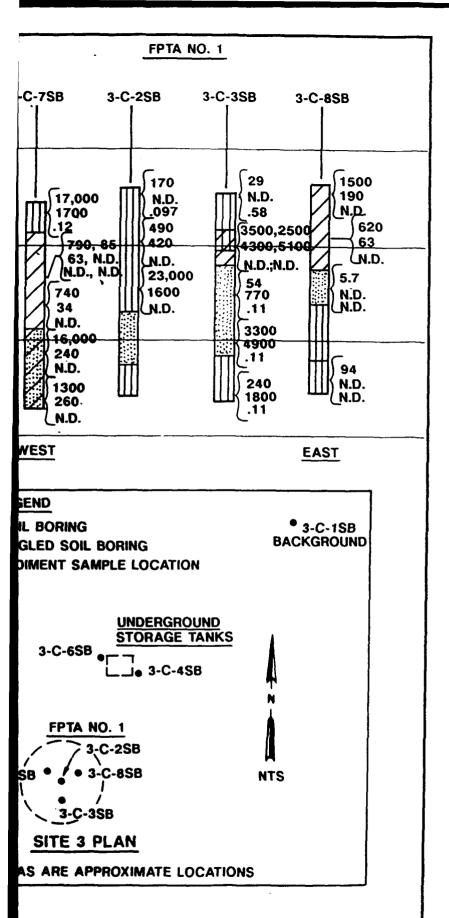
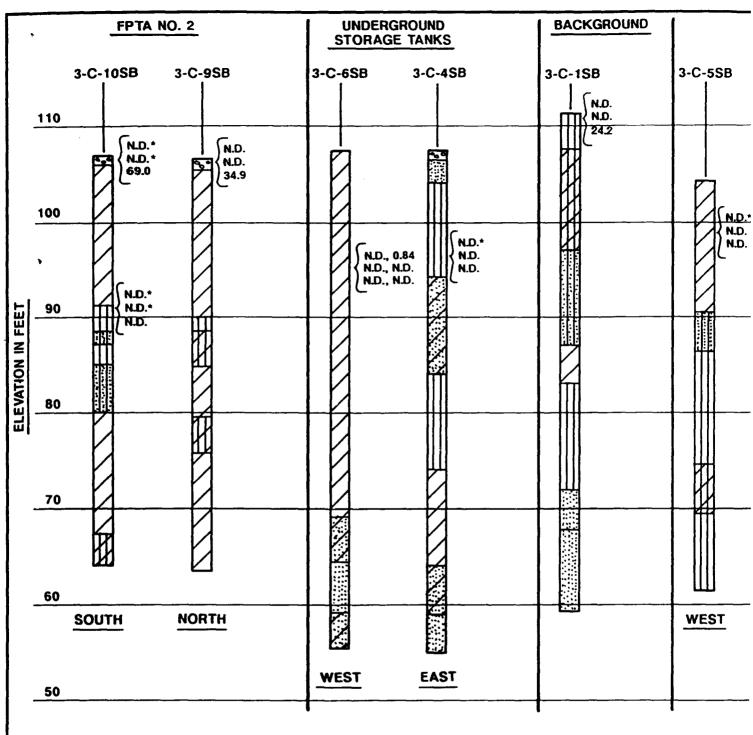
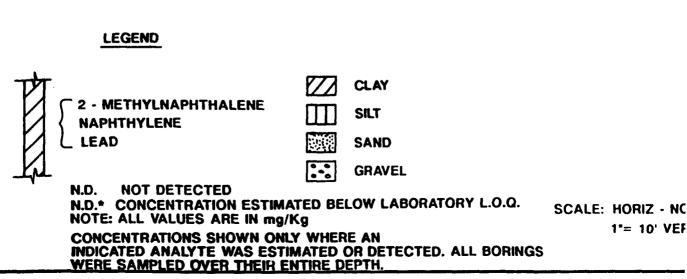


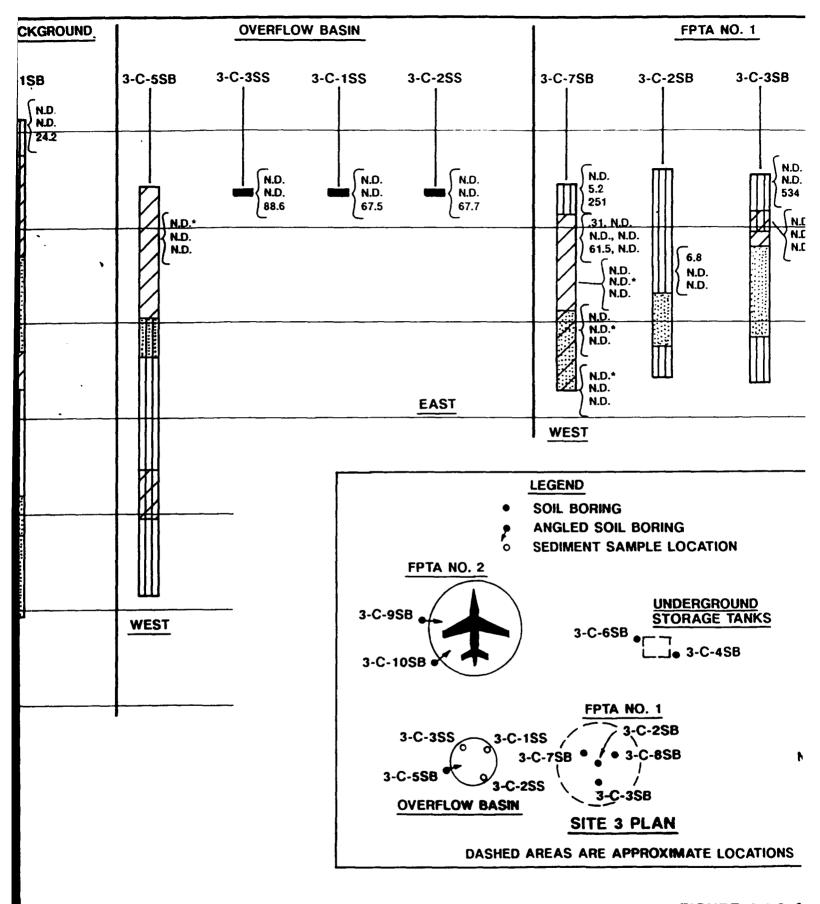
FIGURE 4.1.3-8
TFH-DIESEL, TFH-GAS, AND MERCURY
SOIL SAMPLES
SITE 3: FIRE PROTECTION TRAINING AREA

-СКМНІЦ-





1"= 10' VEF



SCALE: HORIZ - NOT TO SCALE

1"= 10' VERT

NGS

FIGURE 4.1.3-9
SEMI-VOLATILE ORGANICS
SOIL SAMPLES
SITE 3: FIRE PROTECTION TI

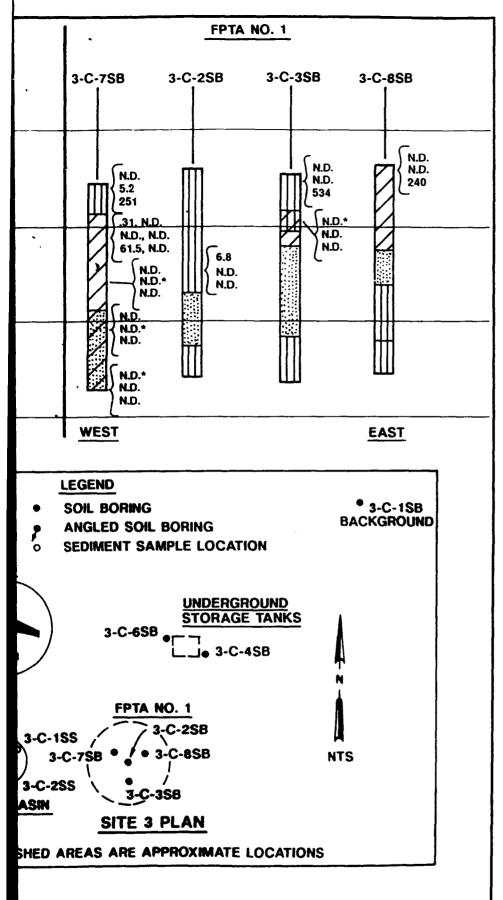


FIGURE 4.1.3-9
SEMI-VOLATILE ORGANICS AND LEAD
SOIL SAMPLES
SITE 3: FIRE PROTECTION TRAINING AREA

CHEM HILL-

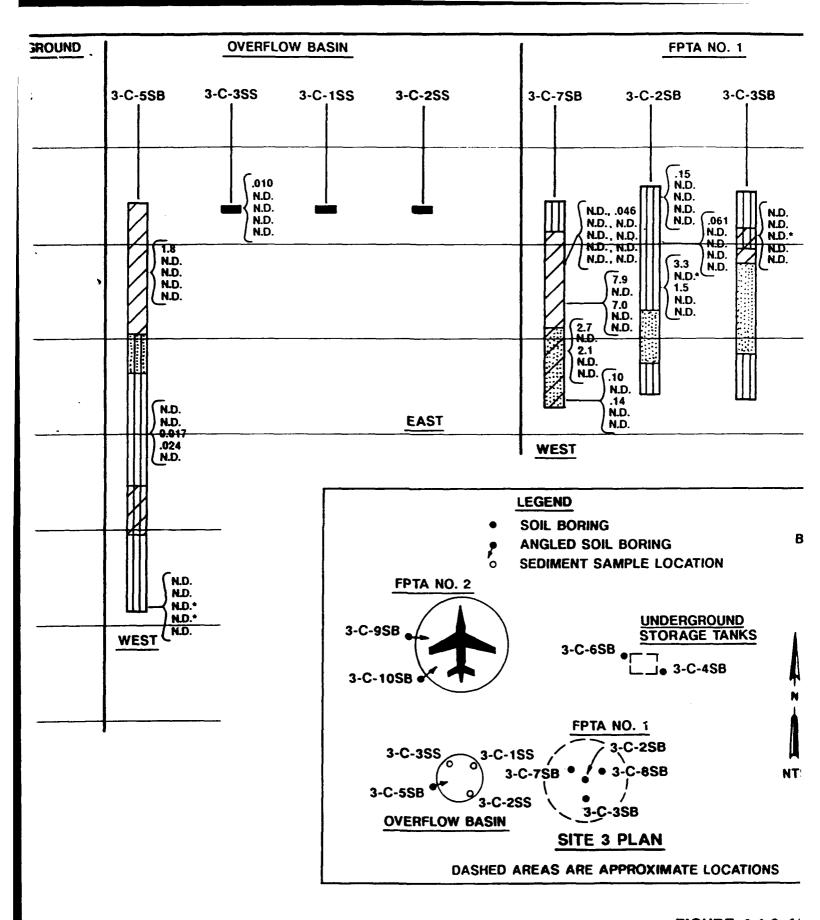
,		FPTA	NO. 2	UNDER STORAG	GROUND SE TANKS	BACKGROUND	2-
		3-C-10SB	3-C-9SB 	3-C-6SB	3-C-4SB 	3-C-1SB	3-C-5SE
	110	72			3.8	<u> </u>	
	100	73 .041 N.D. N.D. .85 N.D. N.D. 052			N.D. N.D. N.D.		
, H:	90	041 .022 .49 N.O.			1.4 N.D. N.D. N.D. N.D.		
ELEVATION IN FEET	80	20. 20. 20. 20. 20. 20. 20. 20. 20.					
	_70	ND. ND. ND. ND.					
	60	N.D. N.D. N.D. N.D. N.D.					
		SOUTH	NORTH	NO SECTION AND ADDRESS OF THE PROPERTY OF THE		لوثيا	WEST
	50			WEST	EAST		
			LEGEND				

N mare	
XYLENES (TOTAL)	CLAY
BENZENE	SILT
1, 2 - DCE TRANS - 1, 2 - DCE	SAND
LIN THANS - 1, 2 - DCE	GRAVEL
N.D. NOT DETECTED N.D.* CONCENTRATION ESTIM NOTE: ALL VALUES ARE IN mg	LOW LABORATORY L.O.Q.

CONCENTRATIONS SHOWN ONLY WHERE AN INDICATED ANALYTE WAS ESTIMATED OR DETECTED. ALL BORINGS WERE SAMPLED OVER THEIR ENTIRE DEPTH.

SCALE: HORIZ -

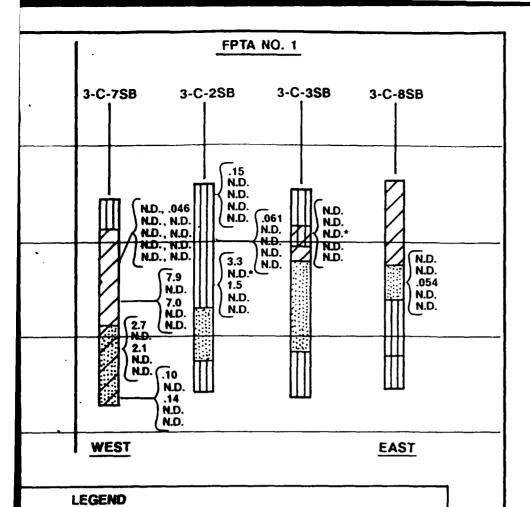
1"= 10"



SCALE: HORIZ - NOT TO SCALE

1'= 10' VERT

FIGURE 4.1.3-10
VOLATILE ORGANI
SOIL SAMPLES
SITE 3: FIRE PROTECTION TRA



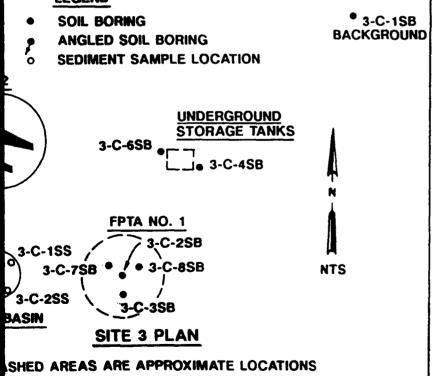


FIGURE 4.1.3-10
VOLATILE ORGANICS
SOIL SAMPLES
SITE 3: FIRE PROTECTION TRAINING AREA

CHM HILL-

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nitrite (expressed as nitrate) varied from 6.4 to 8.6 mg/l. Sulfate ranged from 7.7 to 15.4 mg/l. All the water quality parameters are within ranges observed in groundwater samples from other sites at Beale AFB.

In the second semiannual sampling round at Site 3 (September 1989), no volatile or semivolatile organic compounds were detected except for bis(2-ethylhexyl) phthalate in well 3-A-1 at 17 ug/l. Arsenic was detected for the second time in well 3-A-2 at 0.012 mg/l. No lead, mercury, selenium, TFH-diesel, or TFH-gas were detected in any well in this round. Water quality parameters were similar to the first sampling round with TDS ranging from 244 to 326 mg/l, nitrate from 5.1 to 8.7 mg/l, and sulfate from 8.3 to 20.0 mg/l. Water type again varied from sodium-calcium bicarbonate to calcium-sodium chloride-bicarbonate.

4.1.3.1.4 Analytical Results Table

Table 4.1.3-2 presents a summary of all detected analytes for Site 3. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.3-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of Applicable or Relevant and Appropriate Requirements (ARARs) is given in Appendix I.

4.1.3.1.5 Discussion of Analytical Data

Contaminants in the form of fuel hydrocarbons (TFH and BETX compounds), chlorinated solvents, mercury, and lead were detected in soil samples collected within the FPTA No. 2 overflow basin and/or in a soil boring drilled beneath the basin. The same contaminants were also detected in soil borings drilled near the current and previous fire training areas and near the underground storage tanks. Table 4.1.3-3 presents the range of contaminants encountered for each of the media samples (surface soil, soil, groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants

TABLE 4.1.3-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 3

Including					Standards, and Action	Criteria Levels (a)	3-C-15S BAFB-0073	3-C-285 BAFB-0074	3-C-3SS BAFB-0075	3-C-158 BAFB-0214	3-C-158 BAFB-0215	3-C-158 BAFB-0217
Marked M	Parameter	Method	Detection Limit	Units	Federal	State	11/23/88	11/23/88	11/23/88		12/12/88	12/12/88
Time	Percent Moisture	ASAMO	W/A	×	SE	SE	30.1	28.4		10.6	21.2	21.6
Sabolito 20.0 mg/kg NS 16,700 11700 16600 9500 17500	TFM-Diese!	TFH-D1	1.0	mg/kg	SE	SE	አ የ	86		9	윺	2
Substitute 10.0 275 207 224 142 280 Lima Substitute 0.5 mag/kg NS 75 ND 0.74 ND ND man Substitute 0.5 mag/kg NS 500 45.9 31.6 38.1 23.9 38.5 man Substitute 3.0 mag/kg NS 5.00 45.9 31.6 38.1 23.9 38.5 substitute 3.0 mag/kg NS 2,500 45.9 31.6 38.1 17.8 17.8 substitute 3.0 mag/kg NS 1,000 67.7 88.6 24.2 31.6 substitute 1.0 mag/kg NS 1,000 67.7 88.6 24.2 31.6 substitute 1.0 mag/kg NS 1,000 67.7 88.6 24.2 11.8 11.8 substitute 1.0 mag/kg NS 1,000 67.5 67.7	Atumina	Succession 10	20.0	mo/kg	SH	S#	16700	11700		9500	17500	18500
Line Substitute O.50 mag/kg NS 75 ND ND O.74 ND ND ND ND ND ND ND N	Barius	SW6010	10.0	mg/kg	SE	10,000	273	202		142	280	210
Substitute Sub	Deryl i G	SW6010	0.20	ma/kg	SX	K	2	2		9	욮	2
math Stakeolo 3.0 mag/kg NS 500 45.9 31.6 38.1 23.9 38.5 Subbollo 4.0 mag/kg NS 2,500 57.2 16.8 14.7 16.8 17.8 26.0 Subbollo 5.0 mag/kg NS 1,000 67.5 67.7 88.6 24.2 ND 26.8 subbollo 20.0 mag/kg NS 1,000 67.5 67.7 88.6 24.2 ND 26.8 subbollo 10.0 mag/kg NS 1,000 67.5 67.7 88.6 24.2 ND 17.8 <	Calcium	Su6010	5	mo/kg	SE	SE	3760	3590		2840	5140	3970
Subfolio 4.0 mag/kg NS 2,500 17.2 16.8 14.7 16.8 17.8 Subfolio 3.0 mag/kg NS 2,500 55.2 57.5 65.2 32.1 26.8 Subfolio 10.0 mag/kg NS 1,000 67.5 67.7 68.6 24.2 100 25.2 67.5 65.2 32.1 26.8 subfolio 10.0 mag/kg NS 1,000 67.5 67.7 68.6 24.2 100 25.0 100 25.0 24.0 4790 35.0 470 25.00 470 25.0 470 25.0 470 26.2 26.2 35.0 470 26.0 470 26.0 470 26.0 470 26.0 470 26.0 470 26.0 470 26.1 470 470 470 470 470 470 470 470 470 470 470 470 470 470 470	Chromium	Suc.010	3.0 3.0	MQ/kg	ST	200	45.9	31.6		23.9	38.5	27.8
Subsidio 3.0 mg/kg NS 2,500 55.2 57.5 65.2 32.1 26.8 Subsidio 10.0 mg/kg NS 1,00 67.5 67.7 66.2 32.1 26.8 subsidio 20.0 mg/kg NS 1,00 67.5 67.7 68.6 24.2 ND subsidio 10.0 mg/kg NS 412 57.0 4790 3930 6470 subsidio 1.5 mg/kg NS 2,000 20.0 179.6 52.1 16.8 33.6 subsidio 4.0 mg/kg NS 2,000 26.0 479 52.7 450 52.7 132.0 man 8 2,000 20.0 179.6 22.1 16.8 33.6 33.6 man 8 10.0 41.9 52.7 45.0 55.0 43.9 10.0 43.9 10.0 man 8 10.0 64.4 41.9	Cobelt	SW6010	0.4	mg/kg	SE	8,000	17.2	16.8		16.8	17.8	14.0
Saudo10 10.0 mg/kg NS 24300 17600 24600 19700 23600 Saudo10 20.0 mg/kg NS 1,000 67.5 67.7 88.6 24.2 ND ree Saudo10 1.0 mg/kg NS 1,000 67.7 88.6 24.2 ND ree Saudo10 4.0 mg/kg NS 2,000 20.0 420 527 1320 saudo10 4.0 mg/kg NS 2,000 20.1 14.7 660 635 saudo10 5.0 mg/kg NS 2,000 25.1 450 450 450 saudo10 5.0 mg/kg NS 700 ND ND A5.9 A3.6 saudo10 5.0 mg/kg NS 5,000 41.9 55.9 ND saudo10 2.0 mg/kg NS 5,000 41.9 52.5 50.0 saudo10 2.0 <th< td=""><td>Copper</td><td>Stu6010</td><td>3.0</td><td>mg/kg</td><td>SE</td><td>2,500</td><td>55.2</td><td>57.5</td><td></td><td>32.1</td><td>26.8</td><td>38.3</td></th<>	Copper	Stu6010	3.0	mg/kg	SE	2,500	55.2	57.5		32.1	26.8	38.3
suscito 20.0 mg/kg NS 1,000 67.5 67.7 88.6 24.2 NO rate Suscito 100 mg/kg NS 1,000 67.5 67.7 88.6 24.2 NO rate Suscito 10 mg/kg NS 10 19.6 22.1 16.8 33.6 470 6470 527 1320 ima Suscito 20 mg/kg NS 1270 1060 1470 660 635 33.6 432 37.1 1320 33.6	Iron	Su6010	10.0	mo/kg	SI	SE	24300	17600		19700	23600	22100
team SM6010 100 mg/kg NS NS 4150 4500 4790 3930 6470 team SM6010 1.5 mg/kg NS 2,000 20.0 19.6 52.7 1320 team SM6010 4.0 mg/kg NS 2,000 20.0 19.6 22.1 16.8 33.6 team SM6010 200 mg/kg NS NS 1270 1060 14.70 660 635 ma SM6010 50.0 mg/kg NS 700 ND ND ND 660 635 m SM6010 50.0 mg/kg NS 2,400 64.4 41.9 52.9 ND m SM6010 4.0 mg/kg NS 5,000 132 84.8 11.8 58.8 43.9 m Chloride 2.0 MS NS NS NS NS NS NS NS NS NS	Leed	SW6010	20.0	mo/kg	SE	, 90,	67.5	67.7		24.2	9	욡
subsolid 1.5 mg/kg NS NS 412 517 450 527 1320 subsolid 4.0 mg/kg NS 2,000 20.0 19.6 22.1 16.8 33.6 subsolid 4.0 mg/kg NS 1270 1060 1470 660 635 subsolid 200 mg/kg NS 1700 ND ND 132 371 subsolid 50.0 mg/kg NS 2,400 64.4 41.9 52.5 ND subsolid 4.0 mg/kg NS 2,400 64.4 41.9 52.5 50.8 subsolid 4.0 Mg/kg NS 5,000 132 B 6.8 B 110 B 58.8 60.8 chloride subsolid NS	Hagnesica	Stu6010	5	mg/kg	SZ	SR	4150	4500		3930	6470	6280
SM6010 4.0 mg/kg NS 2,000 20.0 19.6 22.1 16.8 33.6 n SM6010 200 mg/kg NS NS 1270 1060 1470 660 635 SM6010 200 mg/kg NS NS 700 ND ND 132 371 SM6010 4.0 mg/kg NS 2,400 64.4 41.9 52.5 ND 80.8 SM6010 4.0 mg/kg NS 2,400 64.4 41.9 52.5 ND 80.8 SM6010 2.0 mg/kg NS NS 132 B 41.9 52.5 50.8 SM6240 0.005 mg/kg NS NS NS ND ND ND ND Itotal) SM6240 0.005 mg/kg NS NS ND ND ND ND ND SM6270 0.033 mg/kg NS NS <	Hanganese	Stu6010	1.5	mg/kg	SE	ST	412	517		527	1320	621
Substitute Sub	Nickel	Su6010	4.0	MO/Kg	SE	2,000	20.0	19.6		16.8	33.6	33.0
Subfolio 100 mg/kg NS NS 280 251 358 132 371 Subfolio 50.0 mg/kg NS 700 NO NO NO 55.9 NO Subfolio 4.0 mg/kg NS 2,400 64.4 41.9 52.5 57.4 50.8 subfolio 4.0 mg/kg NS NS 0.032 0.004 BJ 0.006 B 0.027 0.031 chloride subfolio 0.005 mg/kg NS NS 0.004 B 0.004 BJ 0.006 B 0.027 0.031 chloride subfolio 0.005 mg/kg NS NS NS ND ND 0.037 ND chloride subfolio 0.005 mg/kg NS NS NS ND 0.006 B 0.031 ND 0.040 chloride subfolio 0.005 mg/kg NS NS NS ND 0.007 ND	Potassium	SW6010	20	MQ/kg	SH	SE	1270	1060		99	635	1220
Subfolt 50.0 mg/kg NS 700 NO ND ND 55.9 ND Subfolt 4.0 mg/kg NS 2,400 64.4 41.9 52.5 57.4 50.8 Subfolt 2.0 mg/kg NS NS 0.032 0.004 B 0.027 0.031 P Chloride Subfolt 0.005 mg/kg NS NS NO ND	Sodium	SW6010	5	mg/kg	SE	SE	580	23		132	371	452
Subsolo 4.0 mg/kg NS 2,400 64.4 41.9 52.5 57.4 50.8 Subsolo 2.0 mg/kg NS 5,000 132 8.6.8 110 8 58.8 43.9 F Chloride Subsolo 0.005 mg/kg NS NS 0.004 8J 0.006 8 0.027 0.031 Subsolo 0.005 mg/kg NS NS NS NO NO 0.031 0.040 Itotal) Subsolo 0.005 mg/kg NS NS NS NS 0.003 ND 0.001 Itotal) Subsolo 0.033 mg/kg NS N	Thellium	SW6010	50.0	mg/kg	SE	8	₽	2		55.9	9	2
Substitute 2.0 mg/kg NS 5,000 132 B 64.8 B 110 B 58.8 43.9 F Chloride Substitution 0.005 mg/kg NS NS 0.032 0.004 BJ 0.005 B 0.031 Substitution Substitution 0.005 mg/kg NS NS 0.005 B 0.031 0.040 Hoth that at a substitution Substitution 0.33 mg/kg NS NS ND 0.59 ND ND 0.12 Inputhalate Substitution 0.33 mg/kg NS NS ND 0.59 ND ND 0.15 J Inputhalate Substitution 0.33 mg/kg NS NS ND 0.59 ND ND 0.15 J	Vanedium	Sta6010	4.0	MO/kg	SZ	2,400	3.5	41.9		57.4	50.8	41.1
chloride \$M8240 0.005 mg/kg NS NS 0.032 0.004 BJ 0.006 B 0.027 0.031 \$M8240 0.010 mg/kg NS NS NS ND ND ND ND (total) \$M8240 0.005 mg/kg NS NS ND ND ND 0.031 0.040 (total) \$M8240 0.005 mg/kg NS NS ND ND 0.037 ND ND Albertalete \$M8270 0.33 mg/kg NS NS ND 0.59 ND 1.2 Alphthalate \$M8270 0.33 mg/kg NS NS NS ND 0.59 ND 0.15 J Alphthalate \$M8270 0.33 Mg/kg NS NS 1.4 1.4 1.6 ND 0.15 J	Zinc	Stu6010	2.0	MQ/kg	SE	2,000	132 8	8.8	_	8 58.8	43.9	63.6
P SMB240 0.010 mg/kg NS NS 0.068 ND	Methylene Chloride	SuB240	0.005	MO/kg	SE	SE	0.032	0.00	3	B 0.027	0.031	0.036
p SMB240 0.005 mg/kg NS NS 0.068 0.003 BJ ND 0.031 0.040	Acetone	SW6240	0.010	mg/kg	S#	SE	0.0% B	9		욮	윺	0.008
k (total) SMB240 0.005 mg/kg NS NS ND ND 0.307 ND ND ND SMB270 0.33 mg/kg NS NS 2.9 B 2.9 B 2.8 B 1.9 B 2.3 B 2.4 B 2.5	Toluene	SW6240	0.005	Mg/kg	SZ	SE	0.068	0.003	2	0.031	0.000	0.011
SMG270 0.33 mg/kg NS NS 2.9 B 2.8 B 1.9 B 2.3 B 1tylphthalate SMG270 0.33 mg/kg NS NS ND 0.59 ND ND 1.2 rthylhexyl)phthalate SMG270 0.33 mg/kg NS NS 1.4 1.4 1.6 ND 0.15 J	Xylenes (total)	SM6240	0.00	mg/kg	SE	SE	2	2	_	욡	윺	욡
1.2 ary phthalate SW8270 0.33 mg/kg NS NS ND 0.59 ND ND 1.2 rthylhexyl)phthalate SW8270 0.33 mg/kg NS NS 1.4 1.4 1.6 ND 0.15 J	Phenol	SW6270	0.33	MO/kg	S¥	SE	2.9	2.9	_	B 1.9	8 2.3	8 2.0 8
e SU6270 0.33 mg/kg NS NS 1.4 1.4 1.6 ND 0.15 J	0i-n-butylphthalate	SNB270	0.33	mg/kg	Ş	SZ	2	0.59		2	1.2	0.87
	bis(2-ethylhexyl)phthalate	Su6270	0.33	mg/kg	SE	SN	1.4	1.4		2	0.15	J 0.23 J

e: equipment wash blank f: field replicate R: resample MT: aralyte not tested

MT: aralyte not tested

MT: aralyte not detected.

MT: detected in () are 2nd column confirmation values.

MT: detected in () are 2nd column confirmation values.

MT: field blank (ambient condition blank)

MT: field replicate

MT: field rep **NOTES: Results reported for detected analytes only.**

TABLE 4.1.3-2 (continued)

				Standards, C and Action L	Criteria Levels (a)	3-C-158 8AFB-0218	3-C-158 8AFB-0219	3-C-15B BAFB-0220	3-C-158 BAFB-0221	3-C-258 BAFB-0222	3-C-258 BAFB-0223
Par amater	Method	Detection Limit	Spits	Federal	State	21.5-23.0 ¹ 12/12/88	30.0-31.5 ¹ 12/12/88	40.0-41.5	50.0-51.5° 12/12/88		5.0-6.5' 12/12/88
Percent Moisture	OFFE	V/II	×	SZ	SE	2	24.4	92	9.1	7.7	71
Mercury	27.77	0,060	ma/ka	<u> </u>	2	2	2	2	2	0.097	2
TFH-Diesel	TFN-DI	1.0	m/kg	S	SE	2	2	2	2	170	84
TFH-Gas	TFH-GA	S	mo/kg	SI	SE	2	2	욮	2	윷	450
Alumina	\$10010	0.02	mo/kg	S	SH	15800	14900	16400	8260	5790	9250
Barica	SW6 010	10.0	M/kg	SH	10,000	<u>5</u>	183	2	124	9.08	784
Beryllius	S 46010	0.20	Ma/kg	SR	ĸ	Q	2	2	2	윺	9.0
Catcius	S146010	8	mo/ko	S	SE	3970	0667	4430	3270	3570	907
Chromium	S46010	3.0	/kg	SE	200	8.02	11.2	15.0	0	20.5	30.1
Cobelt	Su6010	0.4	mo/ko	SE	8,000	16.4	7.7	10.4	5.0	10.8	26.1
Copper	Sta6010	O.	mo/kg	SH	2,500	31.9	18.5	22.5	15.4	24.3	26.5
Lon	SN6010	10.0	mo/kg	SE	SH	21800	19200	15500	13100	14000	20000
Magnesium	S46010	5	mo/kg	SE	SE	3950	4400	5290	2430	2760	4550
Manganese	S146010	1.5	mo/kg	S	SR	745	522	541	483	525	173
Mickel	Sta6010	4.0	Mo/kg	SE	2,000	26.0	10.1	11.8	8.0	28.3	24.2
Potassium	Su6010	200	mo/kg	S	SZ	1000	833	1380	803	508	452
Sodium	S46010	5	MO/KG	SE	SE	256	869	408	177	162	360
Vanadium	S46010	0.4	ma/kg	SE	2,400	53.8	¥.5	23.8	9.62	50.5	61.1
Zinc	S46 010	2.0	10/kg	SH	2,000	24.2	32.8	38.4	32.1	42.8	35.9
Methylene Chloride	SMB240	0.005	Mo/kg	SI	SE	0.030	0.058	0.039	970.0	0.078	0.089
Acetone	SH6240	0.010	mo/kg	SH	S	0.00	90.00	8 0.009	8 0.008	B 0.12	0.28
Toluene	SNB240	0.005	MQ/kg	SE	SH	0.005	90.00	0.022	0.001	720°0 r	0.057
Ethylbenzene	SM6240	0.005	Mo/kg	SE	SE	2	₽	2	2	0.022	9
Xylenes (orm)	SMB240	0.005	Mo/kg	S	SE	2	윤	9	9	0.062	0.051
Xylenes (p)	SNB 240	0.005	Mo/kg	S	SE	9	2	2	2	0.074	윺
Xylenes (total)	SNB240	0.00	MQ/kg	ST	SN	2	¥	2	9	0.14	0.051
Phenol	SMB270	0.33	MQ/kg	SN	SE	1.9	1.7	B 1.9	8 1.8	8 2.1	8 2.2
4-Methylphenol	\$1,6270	0.33	MO/kg	S	SI	9	⊋	2	윺	1.3	₽
Di-n-butyiphthelete	SNB270	0.33	mg/kg	SE	SH	0.82	0.3	0.69	99.0	€	¥

NOTES: Results reported for detected analytes only.

MI: analyte not tested
MI: analyte not detected in blank
MI: analyte not detected.
MI: analyte not detected in limit field replicate
MI: field replication limit
MI: f

TABLE 4.1.3-2 (continued)

				Standards, (Criteria	3-C-25B	3-c-28	3-c-28	3-C-388	3-C-388 ^R	3-C-388
				and Action i	Levels (a)	BAFB-0224	BAFB-0225	BAFB-0260	BAFB-0261	BAFB-0544	BAFB-0262
Parameter	Method	Detection Limit	Units	Federal	State	12/12/88	12,13,88	20.0-21.5' 12/13/88	12/13/88	05/03/89	5.0-6.5 12/13/88
Percent Moisture	ASA#9	V/N	×	SN	SN	18.1	13.1	16.8	13.6	=	18
Mercury	SW7471	0.060	mg/kg	SN	2	웆	9	3	0.58	IN	2
TFH-Diesel	TFM-DI	1.0	mo/kg	N.	SH	23000	3	욮	&	H	3500
TFM-600	TFH-GA	20	mo/kg	SZ	SZ	1600	욯	2	유	H	4300
Alumina	Stat 6010	20.0	MQ/kg	SN	SE	15500	8420	10200	14100	H	13800
Berice	Sado 10	10.0	mg/kg	SR	10,000	2 2	87.9	<u>\$</u>	348	Ŧ	777
Cachrium	State 010	1.0	MQ/kg	SN	5	2	9	2	4.5	H	2
Celcium	Stu6010	5	mg/kg	SH	S	0797	3300	3260	3850	H	2020
Chromium	Stu6 010	3.0	mg/kg	SE	200	33.2	16.1	26.7	61.1	<u> </u>	6.7
Cobelt	Stu6010	0.4	Mg/kg	SM	8,000	13.4	9.1	8.9	10.3	Ħ	28.8
Copper	Stat6 010	3.0	MO/kg	SH	2,500	35.7	29.5	21.6	125	H	35.9
בים	Sta6010	10.0	MO/kg	SE	SH	25200	16800	23600	19200	Ħ	24000
peal	S46010	0.0Z	mg/kg	SH	1,000 1,000	2	ş	a	534	Ħ	₽
Megnesium	Su6010	5	Ma/kg	SI	SR	5030	2573	3270	2720	Z	2620
Hanganese	SW6010	1.5	mo/kg	SZ	SI	177	354	3 2	285	Z	1540
Nicket	Su6010	0.4	mg/kg	SH	2,000	29.3	13.8	14.4	19.7	Z	8.62
Potassium	Stu6010	0 2	MQ/kg	SE	SE	611	437	625	879	*	378
Silver	Su6010	3.0	mg/kg	S¥	200	2	2	욮	4.7	H	윺
Sodium	Su6010	5	MG/kg	SE	NS	611	245	338	293	×	67
Theilie	Su6010	50.0	MO/kg	SH	<u>8</u>	2	8.0	9	皇	Ħ	2
Vanadius	Su6010	6.0	mg/kg	SE	2,400	41.3	45.6	7.97	6.74	7	57.8
2inc	Su6010	2.0	10/kg	SH	2,000	50.1	41.0	43.1	25.0	×	46.1
Nethylene Chloride	SM6240	0.005	mg/kg	SE	WS	0.81	0.006	0.00	2	H	2
Acetone	SMB240	0.010	mg/kg	SE	S#	윺	0.15	0.042	0.058	Ŧ	9
1,2-Dichloroethene (total)	SMB240	0.005	no /ka	SE	SE	0.069	9	0.00	0.021	Ħ	윺
2-Butanone	SMB240	0.010	MO/kg	Ş	SE	2	₽	9	0.008	M	욡
Trichloroethene	SuB240	0.002	mg/kg	S¥	2,040	1.2	2	2	0.052	H	윺
Benzene	SMB240	0.00	MQ/kg	S	SE	0.19	9	욮	0.017	Ħ	윺
Tetrachloroethere	SM8240	0.005	20/kg	S	SE	2	2	웊	0.003	¥.	욽
Toluene	SMB 240	0.002	Mg/kg	S	SN	욮	0.008	0.055	0.76	¥	1.3 J
Ethylbenzene	SMB240	0.002	MQ/kg	SE	SE SE	0.39	⊋	2	0.044	H	2
Xylenes (total)	SMB240	0.005	mg/kg	Ş	S	2.7	윺	욡	0.32	×	2
Phenol	SW8270	0.33	MO/kg	SZ	¥	2	7.1	1.7	E	₽	1.78
2-methylnaphthalene	25.73	0.33	MO/kg	S	SE	9.9	윺	웆	Ħ	욮	유
N-nitrosodiphenylamine	SM6270	0.33	mg/kg	Ş	SE	욮	윺	Q		0.027	윤
Di-n-butyiphthelete	SH6270	0.33	mg/kg	SZ	SN	2	0.54	9.3	. X	윺	0.94
ois(2-ethylhexyl)phthelate	SW6270	0.33	mo/kg	SZ	SH.	욮	0.078	J 0.070 E	IN TO	윺	9

NOTES: Results reported for detected enalytes only. NT: analyte not tested

MD: analyte not detected.

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NS: No standard criteria or action level currently exists.

(); values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

e: equipment wash blank f: field replicate R: resample

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TABLE 4.1.3-2 (continued)

		Detection		Standards, and Action	Criteria Levels (a)	3-C-35B BAFB-0263 6.5-8.01	3-C-358 BAFB-0264 10.0-11.5	3-C-358 BAFB-0265 15.0-16.5	3-C-3SB BAFB-0266 20.0-21.5	3-C-458 BAFB-0267 0.5-2.0	3-C-458 BAFB-0268 10.0-11.5
Parameter	Method	Limit	Units	Federal	State		12/13/88	12/13/88	12/13/88	12/13/88	12/14/88
Percent Moisture	ASA#9	V/H	*	SE	SE	22.8	21.6	25	21.1	13.2	. £
Mercury	17.47L	0.00	ma/kg	SH	2	2	0.11	0.11	0.11	0.14	0.085
TFH-Diesel	TFM-DI	1.0	mg/kg	SI	N	2500	25	3300	240	3800	1800
TFH-Gas	TFH-GA	20	mg/kg	SX	SN	5100	2	0067	1800	1700	240
Atuminum	St46010	20.0	mg/kg	SX	SN	15800	19400	16800	16700	7820	13200
Berice	Stu6010	10.0	MQ/kg	SE	10,000	282	250	157	152	13	192
Beryllica	Sta6010	0.50	MQ/kg	SH	ĸ	0.65	₽	윺	0.63	윺	윺
Calcium	Stu6010	6	MQ/kg	SN	WS	4950	5190	4920	7290	2790	3990
Chromium	Sta6010	3.0	mg/kg	S¥	200	38.5	38.5	26.7	33.5	19.6	44.6
Cobelt	St.6010	4.0	MQ/kg	SH	8,000	10.0	16.6	14.7	12.0	9.6	17.1
Copper	Stu6010	3.0	MQ/kg	SH	2,500	39.1	45.8	39.7	34.5	30.3	36.5
Lon	Suco10	10.0	mg/kg	SH	SN	21900	28100	25900	26100	14100	25200
Magnesium	Stu6010	<u>5</u>	2 0/kg	SH	SE	6100	6100	2650	482 0	3200	5740
Nanganese	Stu6010	1.5	MQ/kg	SH	WS	\$9	653	200	183	289	837
Nickel	Stu6010	4.0	MQ/kg	SH	2,000	30.7	33.7	26.7	20.3	20.7	% %
Potassium	Stu6010	500	MQ/kg	SN	SH	23	8	1150	5	369	878
Sodium	Su6010	5	MQ/kg	SH	SH	11.	563	491		191	273
Thellion	SW6010	50.0	mg/kg	SN	8	2	¥	80.8		윺	욮
Venedium	SW6010	4.0	20/kg	SH	2,400	40.5	57.3	56.8		37.2	62.6
Zinc	Stu6010	5.0	Mg/kg	SE	2,000	0.67	67.0	\$.5		46.5	55.1
Methylene Chloride	SM8240	0.005	mg/kg	S	SH	2	9	0.43	7	BJ 3.3	8 3.2
Acetone	SM8240	6.010	mg/kg	S	SE	1.6.	1.7	1.9		87.0 8	38.0 F
2-Butanone	SM8240	0.010	mg/kg	S	SE	7.0	0.89	ر 0.97	7	₽	욡
Toluene	SW8240	0.005	mg/kg	S	S)	0.83	ş	1.6		2	₽
Ethylbenzene	SMB240	0.002	mg/kg	SE	SE	2	2	윺		2	0.62
Xylenes (O+m)	SNB240	0.005	MQ/kg	S¥	SN	2	윺	2		1.8	1.4
Xylenes (p)	SM8240	0.005	mg/kg	SE	SE	윺	₽	윺	웊	2.0	2
Xylenes (total)	SM8240	0.005	mg/kg	SZ	SH	9	2	윺	물	3.8	1.4
Phenol	SW8270	0.33	mg/kg	S	NS	₽	1.7	9.1.6	B 1.6	8 2.4	B 2.0
2-Hethylnaphthalene	SW8270	0.33	mg/kg	SH	SH	2	₽	욡	윺	윺	0.63
Di-n-butylphthalate	SW8270	0.33	MQ/kg	SN	RS	1.3	13 0.27	8.1 1.2	8 0.34	BJ 1.3	BJ #6
bis(2-ethylhexyl)ohthalate	SH8270	0.33	mg/kg	S	SN	윷	0.26	2E	0.12	9	윤

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MS: analyte not detected.

MS: No atlandard criteria or action level currently exists.

MS: No atlandard criteria or action level. See Appendix I.

MS: No atlandard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

				Standards, and Action I	Criteria Levels (a)	_	3-C-458 BAFB-0270	3-C-4SB BAFB-0271	3-C-458 BAFB-0272	46	3-C-558 BAF8-0241
Parameter	Method	Limit	Units	Federal	State	12/14/88	12/14/88	12/14/88	12/14/88	12/14/88	12/14/88
Percent Moisture	ASA#9	N/A	><	SN	SE	21.2	21.2	25.4	12.2	19.1	20.6
	127275	0.060	ma/ka	SE	2	0.076	0.076	2	0.068	_	¥
164-Diesel	TFM-D1	1.0	mo/ka	SE	SH	£	=	2	⊋		윺
100 C C C C C C C C C C C C C C C C C C	TFH-GA	20	mo/ka	SE	SH	27	3	욡			2
Alcaica	Su6010	20.0	ay/ka	SE	SE	15600	9590	8240			15400
Barita	S146010	10.0	mo/ka	SE	10,000	35	120	158			241
Calcium	Su6010	9	mo/ko	SE	MS	4150	3300	4100			5260
Chronium	Su6010	3.0	mo/kg	SE	200	27.4	7.6	4.7	8.2	26.0	32.1
Cobalt	Su6010	0.4	a/ka	SH	8,000	12.6	7.0	8.6			15.1
Coper	Su6010	3.0	ma/ka	SE	2,500	45.9	16.5	16.1			41.3
Lon	Su6010	10.0	mo/kg	SE	SH	21800	12800	6100		•	25700
Magnesium	Su6010	9	mo/ka	SE	SN	6220	3010	4170			5610
Mandanese	Su6010	1.5	mo/ko	SE	SE	383	1 2	362			809
Nickel	Suc010	4.0	mo/ka	SE	2,000	22.8	7.5	7.5			31.1
Potassium	Su6010	200	ey/kg	SZ	SZ	1280	330	1070			809
sodius	Su6010	5	mo/kg	SH	SH	398	352	328			553
Vanadius	Su6010	4.0	Ma/kg	SN	2,400	38.5	30.5	11.5			55.0
Zine	Su6010	2.0	mo/kg	SN	2,000	71.1	27.7	36.3			47.0
Methylere Chloride	Su6240	0.00	Mo/kg	S#	SE	0.067 8	3.8	B 0.069		40	B 0.17
Acetone	SW6240	0.010	mo/kg	SH	SH	0.014	0.39	J 0.012			4.1
2-Butanone	Su6240	0.010	MQ/Kg	SN	SE	0.047	2	윺		9	2
4-Hethyl-2-Pentanone	Su6240	0.010	mg/kg	S¥	SN	2	윺	윺		9	0.87
Toluene	SM8240	0.00	Mo/kg	SE	SH	0.12	2	0.027		7	웆
Xvienes (o+m)	SM6240	0.00	mg/kg	SH	SE	2	윺	2			윺
XV(enes (D)	Su6240	0.00	MQ/Kg	Ş	SN	2	웊	윺	¥		9
Xvienes (total)	Su8240	0.005	MQ/kg	SH	SN	2	2	웆	욮		۽
Phenol	Su8270	0.33	MQ/kg	SZ	SE	2.4 B	2.3	B 1.9	1.9	B 1.9	8 2.4
2-Hethylnachthalene	Su6270	0.33	#0/kg	Ş	SH	웆	윺	윺	2	0.33	皇
Di-n-butylphthalate	SW8270	0.33	MQ/kg	SN	SH	0.11 B	2	윺	2	9	율
bis(2-ethylhexyl)phthelate	Su6270	0.33	2 /kg	SX	SH	0.41 8	J 0.39	BJ 0.31	BJ 0.34	81 0.35	BJ 0.30

WOTES: Results reported for detected analytes only.

WI: analyte not tested

WI: analyte not tested

WI: analyte not detected.

WI: analyte not detected in blank

J: estimated value, below quantification limits for seample

R: resample

R: resamp

TABLE 4.1.3-2 (continued)

Parameter	Method	Detection Limit	Units	Standards, and Action Federal	, Criteria n Levels (a) State	3-C-5SB BAFB-0242 17.0-18.5 ¹	3-C-5SB BAFB-0243 27.0-28.5	3-C-5SB BAFB-0244 37.0-38.5 12/14/88	3-C-558 BAFB-0245 47.0-48.51 12/13/88	3-C-658 BAFB-0273 0.0-1.5	3-C-6SB BAFB-0274 10.0-11.5
Decree Noi sture	ASA#0	* / *	×	SA	SA	7-71	18.1	20.6	20.7	19.1	19.4
Mercins	27773	5	mo/ko	S Z	2 2	0.070	0.085	0.088	0.076	0.17	0.074
15x-Diese	TFM-D1	1.0	mo/kg	SE	SH	3	2	2	2	2	226
TFH-Gas	TFH-G	20	MQ/kg	SE	SM	2	2	윷	2	9	9
Atumina	5146010	20.0	mg/kg	SR	SH	8760	9240	10300	9520	20100	16300
	Sw6010	10.0	MO/kg	SE	10,000	117	603	710	346	351	336
Beryllium	Su6010	0.50	20/kg	SZ	ĸ	욮	2	9		0.74	욮
Calcida	SW6010	5	MQ/kg	S	SE	3350	3860	0987		4150	0%7
Chromica	SW6010	3.0	mo/kg	SE	200	18.7	23.2	16.4		¥.1	51.4
Cobelt	Su6010	0.4	mo/kg	SZ	8,000	11.7	27.8	26.2	10.2	18.5	19.9
Conner	SW6010	3.0	mo/kg	SE	2,500	28.4	18.3	25.2		52.4	31.9
ren	SW6010	10.0	mo/kg	S#	SH	20900	14500	13600		32000	23200
Negresius	Su6010	5	mo/kg	S	S	2940	3550	0697		5500	2650
Handanese	S146010	1.5	mo/kg	SR	SH	909	1940	2360		937	1220
Nickel	Su6010	0.4	mg/kg	SH	2,000	18.7	17.1	15.1		39.8	31.5
Potassium	Sw6010	500	MQ/kg	SH	SH	2.4	501	932		618	757
Sodies	SW6010	5	MQ/kg	SE	S	924	415	336		607	220
Variation	Sw6010	0.4	ma/kg	SZ	2,400	56.2	49.3	51.0		72.8	47.8
Zinc	Su6010	2.0	mg/kg	SE	2,000	47.3	32.8	33.0		63.3	6.97
Methylene Chloride	SW8240	0.00	MQ/kg	SH	SE	0.22	8 0.031	B 0.026	•	B 0.056	9
Acetone	Su6240	0.010	₩0/kg	SZ	SM	1.0	2	0.016		0.007	9
1,2-Dichloroethene (total)	SW8240	0.00	MQ/kg	SH	SH	₽	0.020	2		9	2
Trichloroethene	Su6240	0.005	mo/kg	SH	2,040	۽	0.017	2		2	2
4-Methyl-2-Pentanone	SMB240	0.010	MO/kg	SZ	SE	0.54	윺	2		0.003	2
Tetrachloroethene	SW6240	0.005	me/kg	Ş	SH	욮	⊋	0.001	-	욮	2
Toluene	SM8240	0.005	mo/kg	SE	SE	0.008	2	윺		97.0	₽
Phenol	SW6270	0.33	MQ/kg	SE	SZ	2.3	8 2.1	8 2.4	•	B 2.6	8 1.5
Phenanthrene	Su6270	0.33	mg/kg	SN	SZ	2	2	2		0.15	9
bis(2-ethylhexyl)phthalate	Su6270	0.33	mg/kg	S	S	0.26	81 0.33	≘	0.35	울 급	ş
MOTES. Desirite reported 60 detected and	detected	vine and view	>			; ; ; ; ;			: : : : : : :	· · · · · · · · · · · · · · · · · · ·	
MT: analyte not tested		•			analyte detected	cted in blank	¥		e: equi	equipment wash blank	blank
The state of the s				•	antimeted ve	-	went ificat	ion Limit	f. fiel	A real inste	

MD: analyte not detected.

MD: Mostandard criteria or action level currently exists.

MD: Mostandard criteria or action level. See Appendix I.

MD: Mostandard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

MD: Mostandard for detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.3-2 (continued)

				and Action Le	Levels (a)		3-C-658 BAF8-0276	5-C-056 BAFB-0277	BAFB-0278	3-C-658 BAFB-0279	BAFB-0418
Parameter	Method	Detection Limit	Units	Federal	State	12/14/88	12/14/88	12/14/88			
Percent Moisture	ASAMP	N/N	×	SR	SN	17.8	21.3	24.9	23.1	17.6	19.3
Mercury	1747us	090.0	ma/kg	SE	2	0.073	0.15	0.093	0.091	IM	3
Tfk-Diesel	TFH-DI	1.0	mg/kg	SN	SZ	630	5.1	280	3	욮	13
TFR-G08	TF#-G	S	mg/kg	SH	SN	027	욮	150	2	2	H
Alumina	Stu6010	20.0	2 /kg	SH	SR	15900	13900	18000	22000		-
	Stu6010	10.0	Mo/kg	SE	10,000	523	137	189	8.	112	H
Beryllia	Stu6010	0.50	Ma/kg	SH	ĸ	웆	£	19.0	⊋		17
Calcius	Stu6010	5	mo/ko	SE	SE	9911	4330	6360	4530		Ħ
Chromica	Stu6010	3.0	ma/kg	SE	20 20 20	49.3	28.7	16.0	18.2		H
Cobelt	SH6010	4.0	MQ/kg	SH	8,000	18.2	12.7	25.3	10.4		H
Copper	Stu6010	3.0	ma/kg	SH	2,500	8. ¥.	6.94	20.0	24.7		H
	Su6010	10.0	mo/kg	SE	SE	24800	22500	20100	26800		Ħ
Meanesium	Stu6010	001	mg/kg	SN	SE	5710	4610	0867	6150		
Handanese	SW6010	1.5	mg/kg	SE	SH	719	705	634	302		*
Zickel	St#6010	6. 0	ma/kg	SI	2,900	35.4	27.2	13.2	16.9		Z
Potassium	SW6010	200	mo/kg	SE	SE	1110	£	28	1300		I
Sodium	St#6010	90	ma/kg	SE	SX	262	370	280	307		H
Vanadium	State 010	4.0	mo/ko	SE	2,400	52.2	42.2	34.1	33.9	13.3	*
2inc	State 010	2.0	mg/kg	S¥	2,000	52.1	6.3	37.5	45.6		X
Methylene Chloride	SMB240	0.002	mg/kg	SH	SH	3.08	3.3	B 2.8	0.4	æ	L
Acetone	SM6240	0.010	mg/kg	S¥	SN	₽	9.0	0.30	J 0.31	-	B H
Chloroform	SMB240	0.005	mg/kg	S	SE	욮	윺	욮	2		THE T
2-Nexanone	SM8240	0.010	mg/kg	SH	S#	2	£	₽	2	윺	H
Total	SM8240	0.00	mg/kg	SH	SE	0.32	읖	2	2	0.083	H
Plenci	SM6270	0.33	MQ/Kg	SH	SZ	2	8.0	B 0.97	1.1	9	=
2-Methylimpithalene	SW6270	0.33	MQ/Kg	SH	SE	3 .0	욡	2	2	욡	=
Phenanthrene	SM6270	0.33	MQ/kg	S¥	SH	⊋	₽	0.10	Q¥	2	LN
Di-n-butylphthalate	SM8270	0.33	MO/Kg	S	SE	2	윺	⊋		97.0	B H
bis(2-ethylhexyl)phthalate	SW6270	0.33	mg/kg	SE	SE SE	0.29	J 0.23	BJ 0.29	BJ 0.33	8. B.	TH

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MD: analyte not detected.

MS: No standard criteris or action level currently exist

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.3-2 (continued)

				Standards, Candards, Candards	Criteria Levels (a)	3-C-658*** BAFB-0419	3-C-758 BAFB-0363	3-C-7SB BAFB-0364	5-C-758 BAFB-0365	3-C-758 BAFB-0366	3-C-758 BAFB-0367
Parameter	Method	Detection Limit	Units	Federal	State	50.5-51.0° 01/19/89	0.0-1.5	5.0-6.5	6.5-8.0	10.0-11.5 ¹ 01/04/89	15.0-16.5° 01/04/89
Percent Moisture	ASARP	V/N	×	SN	SE	19.4	17	16.9	17.7	22.8	19.8
Herourk	1747us	0.060	mo/ko	SE	20	€	0.12	2	Q	2	2
TFH-Diesel	TFH-DI	1.0	mo/ko	SE	SN	H	17000	&	8	140	16000
TFK-Gas	TFH-GA	20	ma/ka	SE	SH		1700	3	皇	¥	240
Alumina	510010	20.0	mo/ka	S	SE		10300	20500	15600	19200	21100
Barium	S146010	10.0	ma/kg	SN	10,000		161	554	592	236	155
Beryllia	SW6010	0.50	mo/kg	SN	ĸ	H	2	0.60	0.61	Ş	윺
Cachium	S146010	1.0	mo/kg	SE	5		2.9	2	2	₽	2
Calcium	S146010	001	mo/kg	SE	S#		3240	2080	4910	5220	5210
Chromium	SW6010	3.0	mo/kg	SE	200	Ξ	37.6	2.6	50.9	42.2	31.0
Cobelt	SM6010	4.0	mo/kg	SE	8,000		11.9	18.1	20.7	18.1	11.2
Cooper	SW6010	N.0	mo/kg	SH	2,500	¥	98.0	44.5	34.5	66. 7	45.1
	S46010	10.0	Mo/kg	SE	SE		18000	35900	24800	30100	29100
Pand	SW6010	20.0	Mo/kg	SE	1,000		251	61.5	욮	윺	2
Meanesium	Su6010	100	ma/kg	S	MS	N	2590	6280	5430	5620	5950
Kanoanese	010975	1.5	mo/kg	SE	SE		343	920	1010	<u>6</u> 2	367
Nickel	Su6010	4.0	Mo/kg	SE	2,000	7	18.1	30.2	31.0	33.9	30.8
Potassius	Su6010	200	MQ/kg	SM	SE		669	517	867	829	1150
Stiver	Su6010	3.0	ma/kg	SR	200	Ħ	0. 7	2	욮	윺	욡
Sodius	SW6010	5	mg/kg	SH	SM		202	309	272	248	19
	SW6010	50.0	mo/kg	SE	2		2	윺	₽	욡	7.7
Vanadius	Su6010	4.0	MO/kg	SN	2,400	=	53.7	71.2	0.09	9.99	51.5
Zinc	SW6010	2.0	MO/Kg	S	2,000	Ħ	141	29.7	46.5	81.5	2.5
Methylene Chloride	SM8240	0.005	MG/kg	SE	SE		2	0.022	0.028	물	₽
Trichloroethene	SW6240	0.005	mg/kg	SE	2,040		욮	2	윺	7.0	2.1
Toluene	SM6240	0.005	MQ/kg	SH	SZ	H	6.3	0.028	0.032	79.0	2.0
Ethylbenzene	SUB240	0.005	MO/kg	SH	SN		0.42	2	윺	1.9	69.0
Xylenes (total)	SW6240	0.002	mg/kg	SE	SZ	*	2	윭	0.0%	7.9	2.7
Nephthalene	Su6270	0.33	mg/kg	SE	SE	Ħ	5.5	욡	윺	9.0	19.0
2-Methylnaphthalene	SW8270	0.33	No/kg	S	SE	Ħ	2	0.31	₽	2	욡
N-nitrogodiphemylamine	SW8270	0.33	10/kg	SH	SH	Ħ	0.41	870.0 LB	3. 0.077	2 2	0.12
Di-n-butylphthelate	SW6270	0.33	MO/kg	SH	SH	H	0.49	BJ 0.32 6	37 0.44	B 0.45	BJ 0.047
hie (2-ethylhexyl) schthalate	SUB270	0.33	MQ/kg	SH	S	Ħ	0.20	3. 0.13 B	3J 0.12	BJ 0.16	2

MOTES: Results reported for detected analytes only.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

MI: analyte not testud

MI: analyte not detected.

MI: field replicate

F: field replicate

MI: analyte not detected.

MI: field replicate

MI: field replicate

F: field replicate

				Standards, and Action	Criteria Levels (a)	3-C-758 BAFB-0368	3-C-8SB BAFB-0369	3-C-8SB BAFB-0370	3-C-8SB BAFB-0371	3-C-8SB BAFB-0372	3-C-8SB BAFB-0373
		Detection				20.0-21.5	0.0-1.5	5.0-6.5	10.0-11.5	15.0-16.5	20.0-21.5
Parameter	Method	Limit	Units	Federal	State	01/04/89	01/05/89	01/05/89	01/05/89	01/05/89	01/05/89
Percent Moisture	ASA#9	K/X	*	SE	Ş	13.8	15.7	82	12.4	22.7	14.7
TFH-Diesel	TFM-DI	1.0	mg/kg	SR	SE	1300	1500	950	5.7	9	\$
1FX-Gas	TFH-GA	20	MQ/kg	SE	SE	98	1 8	3	₽	2	2
Aluminum	Su6010	20.0	mo/kg	SE	SE	9010	8400	11300	11100	23500	2590
Barius	Su6010	10.0	mg/kg	S¥	10,000	61.5	170	365	120	5	87.3
Beryllica	Succo10	0.50	mg/kg	SH	ĸ	9	2	0.73	9	2	윺
Celcium	Su6010	5	MO/kg	SN	SR	2380	3060	3670	3110	5370	2190
Chromica	Sta6010	3.0	MQ/kg	SE	200	28.0	28.0	45.4	24.8	54.3	19.9
Cobelt	Su6010	4.0	MQ/kg	SN	8,000	5.8	13.0	54.4	6.2	18.1	12.9
Copper	St.6010	3.0	mo/kg	SN	2,500	18.6	35.2	27.2	34.4	50.2	18.8
13	S46 010	10.0	MQ/kg	SH	SE	20400	16100	22100	19300	30900	14700
peel	Succo10	20.0	mg/kg	SN	1,000	욮	240	욮	₽	2	욮
Megnesium	Sta6010	2	mg/kg	SN	SE	2220	2610	7260	3320	7180	1950
Manganese	Su6010	5.	mo/kg	SE	SE	152	401	1060	211	677	306
Nickel	Suco10	0.4	mo/kg	SN	2,000	12.8	16.6	27.6	17.1	38.7	11.0
Potassium	Su6010	500	ma/kg	SN	SE	3	534	378	331	1550	웆
Sodium	Su6010	<u>5</u>	mo/kg	SE	SH	194	227	313	363	203	252
Thettiem	Su6010	50.0	mg/ kg	SE	90,	₽	€	웆	₽	70.8	2
Vanadius	Su6010	4.0	MQ/kg	SZ	2,400	63.1	52.8	66.3	48.7	50.5	62.3
Zinc	St46010	2.0	mo/kg	SN	2,000	5.62 50.00	70.6	38.8	39.5	85.3	29.0
Methylene Chloride	SW6240	0.005	MQ/kg	S	SH	2	0.079	5.4	0.015	0.062	0.053
Acetone	SIMB240	0.010	mg/kg	SR	SE	0.017	0.049	2.7	0.047	0,040	0.042
Carbon Disulfide	SU6240	0.005	mg/kg	SE	SE	읖	9	욮	0.003	2	욡
2-Butanone	SHB240	0.010	mg/kg	SE	SE	0.019	욮	0.88	J 0.018	0.012	J 0.014
Trichloroethene	SNB240	0.005	mg/kg	SE	2,040	0.14	욮	0.73	J 0.054	윺	욮
Tetrachloroethene	SM6240	0.00	mg/kg	SR	SE	0.008	2	욮	¥	웆	2
Toluene	SW8240	0.005	MQ/kg	SN	S	0.20	0.14	0.85	0.023	0.034	0.072
Ethylbenzene	SMB240	0.002	MQ/kg	SN	SE	0.063	2	2	€	욯	윺
Xylenes (total)	SMB240	0.005	MQ/kg	SI	SE	0.10	윺	2	£	욮	윷
2-Methylnaphthalene	Su6270	0.33	mg/kg	SZ	Ş	. 82.0	욮	0.13	9	윺	2
N-nitrosodiphenylamine	SIAB270	0.33	mg/kg	SR	Ş	0.066	QX	웆	2	2	욮
Di-n-butylphthalate	Sui6270	0.33	mg/kg	SE	SE	0.32	2	0.15	BJ 0.19	87 0.2 8	BJ NO
bis(2-ethylhexyl)chthalate	SUB270	0.33	mg/kg	SE	SH	0.10	♀	0.11	BJ 0.11	BJ 0.070	8

e: equipment wash blank f: field replicate R: resample NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not tested

ND: analyte not detected.

ND: not analyte not detected.

ND: values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix 1.

The federal standard for Nitrate + Nitrite is given as 10 mg/l ar Mitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

TABLE 4.1.3-2 (continued)

		•		Standards, and Action	Criteria Levels (a)	3-C-958 BAFB-0322	3-C-9SB BAFB-0323	3-C-958 BAFB-0324	3-C-9SB BAFB-0325	3-C-9SB BAFB-0326	3-C-9SB BAFB-0327
Parameter	Method	Detection Limit	Units	Foderal	State	0.0-1.5	01/11/89	01/11/89	01/11/89		01/11/89
Percent Moisture	ASAMP	N/A	*	SH	SH	13.5	20.8	16.5	20.8	21.4	9.62
TFN-Diesel	TFH-D1	1.0	mo/kg	SE	SE	80	8.8	200	2	욮	9
TFH-Gas	3-11	S	mo/kg	SE	SX	140	윺	웆	2	9	2
Atumina	Su6010	20.0	mo/ko	SE	SH	0%9	13400	8980	9470	8400	12600
Berice	Success	10.0	mo/kg	SE	10,000	125	\$	172	162	1150	277
Beryllica	Su6010	0.50	mg/kg	SX	ĸ	2	0.88	윺	92.0	9.0	3
Calcium	Su6010	5	MO/kg	S	SH	2250	4360	3860	3410	4720	2430
Chromica	Stu6010	3.0	20/kg	SN	200	26.8	27.72	18.0	22.7	12.7	19.9
Cobelt	Su6010	4.0	mo/kg	SE	8,000	11.1	34.2	9.5	13.9	6.44	15.6
Copper	S46010	3.0	ma/kg	SE	2,500	35.4	30.7	21.6	22.7	15.3	24.1
100	Su6010	10.0	mo/kg	SE	SE	16200	19400	16500	25800	7260	22700
peol	S46010	20.0	mo/kg	SE	000,	¥.9	2	유	9	9	2
Megnesium	Su6010	<u>5</u>	mg/kg	SE	SE	2890	2620	3010	34.79	3830	6150
Manganese	Su6010	1.5	Mo/kg	S#	SE	325	920	777	558	3780	1050
Nickel	S46010	4.0	mo/kg	SH	2,000	16.2	20.2	18.0	17.7	12.7	22.7
Potassium	Su6010	200	MQ/kg	SX	S#	358	455	⊋	732	483	938
Sodium	Su6010	5	MO/kg	SZ	SE	180 081	611	777	385	346	714
Venedium	Su6010	4.0	mo/kg	SE	2,400	4.7.4	41.7	38.8	83.6	2.69	55.0
Zinc	Su6010	2.0	MO/kg	SE	2,000	57.9	49.5	33.5	41.4	19.1	47.2
Methylene Chloride	SW8240	0.002	MO/kg	SE	ST	욮	0.042	B 0.023	B 0.028	B 0.028	3 0.045 B
Acetone	SUB240	0.010	MO/kg	SR	SH	0.052	2	0.012	B 0.013	800.00	3. 0.007 BJ
2-Butanone	SN8240	0.010	mg/kg	S	SE	웊	2	0.019	0.019	욡	0.041
NOTES: Results reported for detected analytes	or detected	•	only.								
MT: analyte not tested				 	aralyte dete	analyte detected in blank	¥		e: edu	e: equipment wash blank	Slank

MI: shalfyte not tested

MD: shalfyte not detected.

MD: field blank (ambient condition level condition blank)

MD: field replicate are field replicate and field shalfyte are given as 10 mg/l as Mitrate + Mitrite given as Mitrate.

MD: shalfyte not detected for manual shalfyte are given in Apparent for Mitrate and given in Apparent for Mitrate and given in Apparent manual shalfyte are given manual shalfyth manual

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.3-2 (continued)

Nethod Limit Units Federal State 0.0-1.5' 7.5-9.0- sture ASAMP N/A X NS NS 15.6 23.3 sture TFH-DI 1.0 mg/kg NS NS 15.0 23.3 subfolio 20.0 mg/kg NS 10,000 15.2 13200 19.0 subfolio 20.0 mg/kg NS 10,000 15.2 13.0 13.0 subfolio 0.5 mg/kg NS 10,000 47.7 30.0 subfolio 10.0 mg/kg NS 10,000 47.7 36.9 subfolio 3.0 mg/kg NS 10,000 47.7 36.9 subfolio 4.0 mg/kg NS 1,000 47.7 36.9 subfolio 10.0 mg/kg NS 1,000 47.7 36.9 subfolio 10.0 mg/kg NS 1,000 47.7 36.9					Standards, Criteria and Action Levels (•		3-C-10SB BAFB-0329	3-C-10SB BAFB-0330	3-C-10SB BAFB-0331	3-C-10SB BAFB-0407	3-C-10SB BAFB-040B
t Noisture ASAMP N/A X NS HS 15-6 23.3 eeel TFM-DI 1.0 mg/kg NS HS 2700 ND am Sak6010 10.0 mg/kg NS 10,000 152 169 ium Sak6010 10.0 mg/kg NS 10,000 152 169 ium Sak6010 10.0 mg/kg NS 10,000 152 169 ium Sak6010 10.0 mg/kg NS 500 26.9 28.0 ium Sak6010 10.0 mg/kg NS 500 26.9 28.0 ium Sak6010 10.0 mg/kg NS 10.00 26.9 28.0 ium Sak6010 10.0 mg/kg NS 10.00 26.9 28.0 ium Sak6010 10.0 mg/kg NS 10.00 26.9 28.0 ium Sak6010 10.0 mg	Perameter	Method	Detection Limit	Units				7.5-9.0	17.5-19.0° 01/12/89	27.5-29.0	37.5-39.0° 01/12/89	47.5-49.0
eeel TFH-DI 1.0 mg/kg NS NS 2700 ND am SM6010 1.0 mg/kg NS 175 150 39 ium SM6010 1.0 mg/kg NS 10,000 152 169 ium SM6010 1.0 mg/kg NS 10,000 152 169 ium SM6010 1.0 mg/kg NS 10,000 9.5 165 m SM6010 3.0 mg/kg NS 500 26.9 28.0 m SM6010 3.0 mg/kg NS 1,000 9.5 11.3 ium SM6010 1.0 mg/kg NS 1,000 69.0 26.0 ium SM6010 1.0 mg/kg NS 1,000 69.0 28.0 ium SM6010 1.0 mg/kg NS 1,000 69.0 11.3 ium SM6010 4.0 mg/kg NS </th <th>Percent Moisture</th> <th>ASA#9</th> <th>W/A</th> <th>×</th> <th>SE</th> <th>NS.</th> <th>15.6</th> <th>23.3</th> <th>26.7</th> <th>13.7</th> <th>22.8</th> <th>27.72</th>	Percent Moisture	ASA#9	W/A	×	SE	NS.	15.6	23.3	26.7	13.7	22.8	27.72
same TFM-GA 50 mg/kg NS 330 39 Lam Stadd10 12.0 mg/kg NS 10,000 152 150 Lam Stadd10 10.0 mg/kg NS 10,000 152 150 Lam Stadd10 10.0 mg/kg NS 10,000 152 150 Lam Stadd10 10.0 mg/kg NS 500 26.9 28.0 Stadd10 4.0 mg/kg NS 5.00 47.7 36.8 Stadd10 10.0 mg/kg NS 1,000 69.0 NG Stadd10 10.0 mg/kg NS 1,000 67.0 NG Lam Stadd10 2.0 mg/kg NS 1,000 67.0 NG Lam Stadd10 1.0 mg/kg NS 1,000 67.0 NG Lam Stadd10 1.0 mg/kg NS 1,000 67.1 NG <th>TFH-Diesel</th> <td>TFH-DI</td> <td>1,0</td> <th>mo/ko</th> <td>SH</td> <td>Ş</td> <td>2700</td> <td>2</td> <td>00%</td> <td>9</td> <td>Q</td> <td>9</td>	TFH-Diesel	TFH-DI	1,0	mo/ko	SH	Ş	2700	2	00%	9	Q	9
Lime SMAGOTO 20.0 mg/kg NS 10,000 152 159 Lime SMAGOTO 0.50 mg/kg NS 10,000 152 169 Lime SMAGOTO 0.50 mg/kg NS 10,000 152 169 m SMAGOTO 10.0 mg/kg NS 10,000 9.5 11.3 swafott 1.0 mg/kg NS 5,000 4.7 36.8 swafott 1.0 mg/kg NS 1,000 69.0 ND swafott 2.0 mg/kg NS 2,000 13.0 SA swafott	TFM-Gas	TFR-GA	2	go/kg	S	S	330	66	200	2	2	2
ium SMAGOTO 10.0 mg/kg NS 10,000 152 169 ium SMAGOTO 0.50 mg/kg NS 75 NO 0.65 ium SMAGOTO 0.50 mg/kg NS 500 26.9 28.0 um SMAGOTO 3.0 mg/kg NS 500 26.9 28.0 swadott 3.0 mg/kg NS 2,500 47.7 36.8 swadott 10.0 mg/kg NS 1,000 69.0 11.3 swadott 10.0 mg/kg NS 1,000 69.0 11.3 swadott 10.0 mg/kg NS 1,000 69.0 11.3 ium Swadott 10.0 mg/kg NS 1,000 69.0 11.3 ium Swadott 10.0 mg/kg NS 1,000 69.0 11.3 ium Swadott 1.0 mg/kg NS 1,000 67.7	Atuminum	Su6010	20.0	g/kg	SE	¥	7330	13200	22100	10900	9250	17000
ium Sak6010 0.50 mg/kg NS 75 NO 0.65 um Sak6010 100 mg/kg NS 500 27.0 28.0 um Sak6010 3.0 mg/kg NS 500 26.9 28.0 sak6010 4.0 mg/kg NS 2,500 47.7 3.0 300 sak6010 10.0 mg/kg NS 2,500 47.7 36.8 sak6010 10.0 mg/kg NS 1,000 69.0 ND sak6010 1.5 mg/kg NS 1,000 69.0 ND um Sak6010 1.5 mg/kg NS 2,000 47.7 36.8 um Sak6010 4.0 mg/kg NS 2,000 47.7 36.8 um Sak6010 4.0 mg/kg NS 2,000 47.3 36.9 um Sak6010 4.0 mg/kg NS 2,000 47.3	Berice	Stu6 010	10.0	mg/kg	HS T	0,00	152	169	207	235	1410	
max SM6010 100 mg/kg NS 2710 3000 um SM6010 3.0 mg/kg NS 500 26.9 28.0 sM6010 3.0 mg/kg NS 2,500 47.7 36.8 sM6010 10.0 mg/kg NS 2,500 47.7 36.8 sM6010 10.0 mg/kg NS 1,000 69.0 ND sw6010 10.0 mg/kg NS 1,000 69.0 ND see sM6010 1.0 mg/kg NS 1,000 69.0 ND sw6010 1.0 mg/kg NS 1,000 69.0 ND ium sM6010 1.0 mg/kg NS 1,000 69.0 ND ium sM6010 1.0 mg/kg NS 1,000 69.0 ND ium sM6010 1.0 mg/kg NS 1,000 47.7 36.8 ium <	Beryllius	Su6010	0.50	mg/kg	SE	ĸ	2	0.65	99.0	2	0.78	
Lime SM6010 3.0 mg/kg NS 500 26.9 28.0 SM6010 4.0 mg/kg NS 2,500 47.7 36.8 SM6010 20.0 mg/kg NS 1,000 69.0 11.3 SM6010 20.0 mg/kg NS 1,000 69.0 11.3 SM6010 20.0 mg/kg NS 1,000 69.0 11.3 eace SM6010 20.0 mg/kg NS 1,000 69.0 11.3 case SM6010 20.0 mg/kg NS 2,000 13.0 23.6 Lum SM6010 20.0 mg/kg NS 2,000 13.0 23.5 Lum SM6010 4.0 mg/kg NS 2,000 17.3 26.5 Lum SM6010 50.0 mg/kg NS 2,000 17.3 26.5 Lum SM6010 4.0 mg/kg NS 2,000 17.3	Calcium	St46010	5	Mo/ko	SE	SE	2710	3000	0255	3060	5030	
Subsolio 4.0 mg/kg NS 8,000 9.5 11.3 subsolio 3.0 mg/kg NS 2,500 4.7.7 36.8 subsolio 10.0 mg/kg NS 1,000 69.0 ND subsolio 10.0 mg/kg NS 1,000 69.0 ND subsolio 1.5 mg/kg NS 1,000 69.0 ND subsolio 1.5 mg/kg NS 1,000 69.0 ND i.m Subsolio 1.5 mg/kg NS 1,000 69.0 ND i.m Subsolio 1.0 mg/kg NS 1,00 69.0 ND i.m Subsolio 1.0 mg/kg NS 1,00 67.1 36.8 i.m Subsolio 4.0 mg/kg NS 7.00 ND 70.7 55.1 i.m Subsolio 4.0 mg/kg NS 1,00 0.049 B <	Chromium	Su6010	3.0	MQ/kg	SE	50 50 50	56.9	28.0	40.8	26.3	12.8	
SM6010 3.0 mg/kg NS 2,500 47.7 36.8 suscord 10.0 mg/kg NS 1,000 69.0 ND suscord 10.0 mg/kg NS 1,000 69.0 ND suscord 1.0 mg/kg NS 1,000 69.0 ND mm Suscord 1.0 mg/kg NS 1,000 69.0 ND mm Suscord 1.0 mg/kg NS 1,000 69.0 ND mm NS 1.0 1.0 1.0 1.0 1.0 1.0 1.0 mm NS 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Cobalt	Su6010	6.0	mo/kg	SH	8,000	9.5	11.3	13.6	18.5	54.6	
succion 10.0 mg/kg NS NS 14900 20700 tum Succion 20.0 mg/kg NS 1,000 69.0 ND eace Succion 1.0 mg/kg NS 1,000 69.0 ND eace Succion 1.5 mg/kg NS 2,000 13.0 23.5 tum Succion 2.0 mg/kg NS 2,000 13.0 23.5 tum Succion 2.0 mg/kg NS 2,000 13.0 23.5 um Succion 2.0 mg/kg NS 2,000 13.0 23.5 um Succion 4.0 mg/kg NS 2,000 17.7 50.5 ner Chloride 8.0 1.0 1.0 1.0 1.0 1.0 ner Chloride NS 2.0 NS 2.0 0.0 50.5 ner Succion 1.2 1.2 1.2	Copper	Su6010	3.0	20/kg	£	2,500	47.7	8.98	0.64	24.3	22.0	
student Student 20.0 mg/kg NS 1,000 69.0 ND student Student 1.5 mg/kg NS 1,000 69.0 ND classina Student 1.5 mg/kg NS 2,000 13.0 23.5 classina Student 2.0 mg/kg NS 2,000 13.0 23.5 m Student 2.0 mg/kg NS 7.0 ND ND i.um Student 2.0 mg/kg NS 2,400 47.3 56.1 i.um Student 4.0 mg/kg NS 7.0 ND ND i.um Student 4.0 mg/kg NS 2,400 47.3 56.1 i.um Student 4.0 mg/kg NS 0.77 0.77 0.55.1 i.um Student 4.0 mg/kg NS NS 0.77 0.73 0.03 i.um Acetate	Iron	Suc 010	10.0	10/kg	SH	SE	14900	20700	25000	20400	8060	
stum SM6010 100 mg/kg NS NS 2750 5740 neare SM6010 1.5 mg/kg NS NS 437 369 1 SM6010 4.0 mg/kg NS 2,000 13.0 23.5 m SM6010 200 mg/kg NS 700 ND ND ium SM6010 4.0 mg/kg NS 700 ND ND ium SM6010 4.0 mg/kg NS 700 ND ND ium SM6010 4.0 mg/kg NS 700 47.3 50.5 ium SM6010 4.0 mg/kg NS NS 700 ND ium SM6010 4.0 mg/kg NS NS 0.00 70.7 55.1 ium SM6010 2.0 mg/kg NS NS NS 0.00 ium SM6240 0.010 mg/kg NS<	Lead	SU6010	20.0	MQ/kg	SE	90,	0.69	2	2	9	2	
rese SM6010 1.5 mg/kg NS 2,000 13.0 23.5 i. SM6010 4.0 mg/kg NS 2,000 13.0 23.5 i.m SM6010 2.0 mg/kg NS NS 259 587 i.m SM6010 50.0 mg/kg NS 700 ND ND i.m SM6010 50.0 mg/kg NS 2,400 77.3 50.5 i.m SM6010 2.0 mg/kg NS NS 0.049 B 0.010 i.m SM6240 0.005 mg/kg NS NS NS 0.049 B 0.010 B re SM6240 0.005 mg/kg NS NS 0.04 B 0.010 B 0.04 B 0.04 <th>Magnes fum</th> <th>SLK6010</th> <th>5</th> <th>MO/kg</th> <th>SE</th> <th>¥</th> <th>2750</th> <th>5740</th> <th>6850</th> <th>3430</th> <th>4300</th> <th></th>	Magnes fum	SLK6010	5	MO/kg	SE	¥	2750	5740	6850	3430	4300	
I. SM6010 4.0 mg/kg NS 2,000 13.0 23.5 sium SM6010 200 mg/kg NS NS 486 378 ium SM6010 50.0 mg/kg NS 700 ND ND ium SM6010 50.0 mg/kg NS 700 ND ND ium SM6010 5.0 mg/kg NS 2,400 47.3 50.5 ium SM6010 2.0 mg/kg NS 100 700 ND ium SM6010 2.0 mg/kg NS NS NS 0.045 B 0.010 ium SM6240 0.005 mg/kg NS NS NS 0.04 ND 0.052 Acetate SM6240 0.010 mg/kg NS NS 0.04 ND 0.052 ince SM6240 0.005 mg/kg NS NS NS 0.04 0.055	Hanganese	SW6010	7.5	10/k 9	SE	S	437	369	553	983	4570	
stum SM6010 200 mg/kg NS NS 486 378 m SM6010 100 mg/kg NS 700 ND ND flum SM6010 50.0 mg/kg NS 700 47.3 50.5 flum SM6010 4.0 mg/kg NS 700 47.3 50.5 flum SM6010 4.0 mg/kg NS 2,400 47.3 50.5 subsciol 0.010 mg/kg NS NS NS 0.049 B 0.010 B re SM8240 0.010 mg/kg NS NS NS 0.049 ND 0.052 anore SM8240 0.010 mg/kg NS NS NS 0.04 ND ce SM8240 0.005 mg/kg NS NS 0.04 ND re SM8240 0.005 mg/kg NS NS 0.04 0.065	Nickel	Su6010	4.0	MQ/kg	SE	2,000	13.0	23.5	6.97	19.7	14.2	
m SM6010 100 mg/kg NS NS 259 587 tum SM6010 50.0 mg/kg NS 700 ND ND tum SM6010 4.0 mg/kg NS 7,00 47.3 50.5 tene Chloride SM6010 2.0 mg/kg NS NS 0.049 0.010 B tene Chloride SM6240 0.005 mg/kg NS NS 0.049 0.010 B none SM6240 0.010 mg/kg NS NS NS 0.049 0.013 Acetate SM6240 0.010 mg/kg NS NS 0.04 ND Icroethere SM6240 0.010 mg/kg NS NS NS 0.03 ne SM6240 0.005 mg/kg NS NS 0.041 ND ne SM6240 0.005 mg/kg NS NS 0.040 0.065 ne </th <th>Potassium</th> <td>Su6010</td> <td>200</td> <th>mg/kg</th> <td>SE</td> <td>SE</td> <td>984</td> <td>378</td> <td>1150</td> <td>823</td> <td>803</td> <td></td>	Potassium	Su6010	200	mg/kg	SE	SE	984	378	1150	823	803	
tum SM6010 50.0 mg/kg NS 700 ND ND fum SM6010 4.0 mg/kg NS 2,400 47.3 50.5 sw6010 2.0 mg/kg NS NS 0.049 0.010 B tene Chloride Sw8240 0.005 mg/kg NS NS 0.049 0.010 B -1,2-Dichloroethene Sw8240 0.005 mg/kg NS NS 0.049 0.010 B Acetate Sw8240 0.010 mg/kg NS NS 0.04 0.013 Icroethene Sw8240 0.010 mg/kg NS NS 0.03 J ND Icroethene Sw8240 0.005 mg/kg NS NS NS 0.041 ND ne NS NS NS NS 0.041 ND ND benzene Sw8240 0.005 mg/kg NS NS 0.10 ND </th <th>Sodium</th> <td>Su6010</td> <td>5</td> <th>MO/kg</th> <td>SH</td> <td>Ş</td> <td>259</td> <td>287</td> <td>30</td> <td>344</td> <td>334</td> <td></td>	Sodium	Su6010	5	MO/kg	SH	Ş	259	287	30	344	334	
tium SM6010 4.0 mg/kg NS 2,400 47.3 50.5 SM6010 2.0 mg/kg NS 2,400 47.3 50.5 Cere Chloride SM6240 0.005 mg/kg NS NS 0.049 0.010 B -1,2-Dichloroethere SM8240 0.010 mg/kg NS NS 0.05 0.033 Acetate SM8240 0.010 mg/kg NS NS 0.14 0.018 Loroethere SM8240 0.010 mg/kg NS NS 0.14 0.018 Loroethere SM8240 0.010 mg/kg NS NS 0.041 ND Increase SM8240 0.005 mg/kg NS NS 0.041 ND Denzene SM8240 0.005 mg/kg NS NS 0.10 ND Ass MS NS NS NS 0.10 ND Ass MS NS <th< th=""><th>That! icm</th><td>S46010</td><td>50.0</td><th>MO/kg</th><td>SR</td><td>2</td><td>욮</td><td>9</td><td>7.02</td><td>욮</td><td>Q</td><td></td></th<>	That! icm	S46010	50.0	MO/kg	SR	2	욮	9	7.02	욮	Q	
Substitution 2.0 mg/kg NS 5,000 70.7 55.1 Terrection Substitution Substitution Mg/kg NS NS 0.049 B 0.010 B -1,2-Dichloroethene Substitution 0.010 mg/kg NS NS 0.70 0.022 -1,2-Dichloroethene Substitution 0.010 mg/kg NS NS 0.70 0.022 Acetate Substitution 0.010 mg/kg NS NS 0.14 0.018 Icroethene Substitution Substitution NS NS NS 0.033 J ND ref Substitution 0.005 mg/kg NS NS 0.041 ND ref Substitution 0.005 mg/kg NS NS 0.040 0.065 benzene Substitution 0.005 mg/kg NS NS 0.040 0.065 benzene Substitution 0.005 mg/kg NS	Vanadium	S46010	0.4	MQ/Kg	. SN	2,400	47.3	50.5	51.4	55.6	70.2	
SUB240 0.005 mg/kg NS NS 0.049 0.010 B SUB240 0.010 mg/kg NS NS 0.70 0.022 SUB240 0.010 mg/kg NS NS 0.14 0.013 SUB240 0.010 mg/kg NS NS 0.14 0.018 SUB240 0.010 mg/kg NS NS 0.033 J NO SUB240 0.005 mg/kg NS NS 0.041 NO 0.052 SUB240 0.005 mg/kg NS NS 0.041 NO 0.065 SUB240 0.005 mg/kg NS NS 0.041 NO 0.065 SUB240 0.005 mg/kg NS NS 0.10 NO NO SUB240 0.005 mg/kg NS NS 0.72 NO SUB240 0.005 mg/kg NS NS 0.72 NO <t< th=""><th>Zinc</th><th>Su6010</th><th>2.0</th><th>MO/kg</th><th>SE</th><th>99,</th><th>7.02</th><th>55.1</th><th>66.3</th><th>47.7</th><th>23.3</th><th></th></t<>	Zinc	Su6010	2.0	MO/kg	SE	99,	7.02	55.1	66.3	47.7	23.3	
SUB240 0.010 mg/kg NS NS 0.70 0.022 SUB240 0.005 mg/kg NS NS 0.85 0.033 SUB240 0.010 mg/kg NS NS 0.14 0.018 SUB240 0.010 mg/kg NS 2,040 ND 0.052 SUB240 0.005 mg/kg NS NS 0.041 ND SUB240 0.005 mg/kg NS NS 0.065 SUB240 0.005 mg/kg NS NS 0.10 ND SUB240 0.005 mg/kg NS NS 0.10 ND SUB220 0.005 mg/kg NS NS 0.72 ND SMB270 0.33 MS NS NS ND	Methylene Chloride	SW8240	0.002	10/kg	S	¥	0.049 B	0.010	B 0.044	90.00	8 0.009	
SM8240 0.005 mg/kg NS NS 0.85 0.033 SM8240 0.010 mg/kg NS NS 0.14 0.018 SM8240 0.010 mg/kg NS NS 0.033 J ND SM8240 0.005 mg/kg NS NS 0.041 ND 0.052 SM8240 0.005 mg/kg NS NS 0.40 0.065 SM8240 0.005 mg/kg NS NS 0.10 ND SM8240 0.005 mg/kg NS NS 0.72 ND SM8240 0.005 mg/kg NS NS 0.72 ND SM8270 0.33 mg/kg NS NS NS 0.72 ND SM8270 0.33 mg/kg NS NS NS 0.78 J ND	Acetone	SM8240	0.010	mg/kg	SH	S	0.70	0.022	0.067	J 0.012	0.009	
sM8240 0.010 mg/kg NS NS 0.14 0.018 ate SM8240 0.010 mg/kg NS NS 0.033 J NO there SM8240 0.005 mg/kg NS NS 0.041 ND sM8240 0.005 mg/kg NS NS 0.40 0.065 ne SM8240 0.005 mg/kg NS NS 0.10 ND orall SM8240 0.005 mg/kg NS NS 0.72 ND e SM8270 0.335 mg/kg NS NS 0.78 ND	trans-1,2-Dichloroethene	SM8240	0.00	mg/kg	S	S	0.85	0.033	윭	유	욮	
SM6240 0.010 mg/kg NS 2,040 ND 0.052 NS NS 0.041 ND 0.052 NS NS NS 0.40 0.065 NS NS NS 0.10 ND ND SM6240 0.005 mg/kg NS NS 0.10 ND SM6270 0.005 mg/kg NS NS 0.72 ND SM6270 0.33 mg/kg NS NS 0.78 ND	2-Butanone	SNB240	0.010	20/kg	SE	S	0.14	0.018	0.041	0.00	J 0.010	
E SM6240 0.005 mg/kg NS 2,040 NO 0.052 SM240 0.005 mg/kg NS NS 0.041 NO SM240 0.005 mg/kg NS NS 0.40 0.065 SM2240 0.005 mg/kg NS NS 0.10 NO SM2240 0.005 mg/kg NS NS 0.72 ND SM2270 0.33 mg/kg NS NS O.78 NO	Vinyl Acetate	SM8240	0.010	10/kg	SE	Ş	0.033	2	۽	2	욮	
SUB240 0.005 mg/kg NS NS 0.041 ND SUB240 0.005 mg/kg NS NS NS 0.40 0.065 SUB240 0.005 mg/kg NS NS 0.10 ND SUB240 0.005 mg/kg NS NS 0.72 ND SUB270 0.33 mg/kg NS NS 0.78 J ND	Trichloroethene	SM8240	0.005	Me/kg	SE	2,040	9	0.052	0.49	0.007	0.047	
SUB240 0.005 mg/kg NS NS 0.40 0.065 SUB240 0.005 mg/kg NS NS 0.10 ND SUB240 0.005 mg/kg NS NS 0.72 ND SUB270 0.33 mg/kg NS NS 0.78 J ND	Benzene	SM8240	0.005	#0/kg	SE	S	0.041	2	0.022	욡	웆	
SUB240 0.005 mg/kg NS NS 0.10 ND SUB240 0.005 mg/kg NS NS 0.72 ND SUB270 0.33 mg/kg NS NS 0.78 J ND	Toluene	SMB240	0.005	mg/kg	SE	Ş	0.40	0.065	0.18	0.029	0.096	
) SUB240 0.005 Mg/kg NS NS 0.72 ND SUB270 0.33 Mg/kg NS NS O.78 J ND	Ethylbenzene	SHB240	0.005	10 /kg	SE	ş	0.10	2	9	2	2	
SM8270 0.33 mg/kg NS NS 0.78 J ND	Xylenes (total)	SNB240	0.005	mg/kg	SH	Ş	0.72	2	0.041	2	Ş	2
	Naph tha lene	SH6270	0.33	10 /kg	S	¥	0.78	2	1.4	2	욮	2
0.33 mg/kg NS NS 1.9 J ND	2-Hethylnaphthalene	SW8270	0.33	mg/kg	SE	¥	1.9	2	3.3	2	윷	2

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NS: No standard criteria or action level currently exists. NOTES: Results reported for detected analytes only. ND: analyte not detected. MT: analyte not tested

e: equipment wash blank f: field replicate

R: resemple

(); values listed in () are 2nd rolumn confirmation values.

* Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.3-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 3

				Standards, And Action	Criteria Levels (a)	3-C-164	3-c-164	3-c-164	3-c-164 ^b	3-A-1GV	3-A-2GW
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0521 04/03/89	BAFB-0522 04/03/89	BAFB-0519 04/03/89	BAFB-0520 04/03/89	BAFB-0511 03/29/89	BAFB-0513 03/30/89
Specific Conductivity	E120.1	1.0	Carlos/Car	SN	8	283	282	=	-	350	=
Temperature	E170.1	X	O G	SZ	SE	20.8	20.8	TM		22.0	*
	E150.1	W/W	Ŧ	2-9	SN	6.8	9.9	Ħ	H	7.05	Ħ
Alkalinity - Total	SP# 03	1.0	- /0	20	SN	8. 8.	77.6	Ħ	H	7.08	H
Bicarbonate	SM4 03	1.0	1	SE	SE	4.76	7.7	Ħ	H	98.1	Ħ
Total Dissolved Solids	E160.1	3.0	7	200	200	267	32	37.0	Ħ	&	₹
Chloride	E325.3	1.0	Ž	250	250	42.2	45.4	¥	LN	50.3	59.5
Fluoride	E340.2	0.050	7	7	1.4	0.22	0.25	욮	Ħ	0.24	0.18
Hitrate + Mitrite	E353.3	0.020	7	10	45	4.8	8.2	0.48	¥	7.8	6.38
Sulfate	E375.4	1.0	7	220	220	8	15.4	욮	Ħ	11.6	15.2
Arsenic	SA77060	0.0050	7	5	.05	2	H	욡	Ħ	욮	0.0110
TFH-Ges	TFH-G	0.10	7/0	SZ	SX	2	0.10	윺	H	욮	윺
Celcium	Su6010	5.8	7	SE	SZ	20.8	21.2	2	H	28.2	25.8
Magnesium	Sta6010	9.6	7	SE	SE	9.73	8.6	2	7	10.9	11.5
Hanganese	SW6010	0.0150	7	5	9	욮	웆	욮	H	0.0310	9
Potassium	SW6010	- 8.	1/2	SE	SI	1.80	1.80	욽		2.00	2.10
Sodium	St#6010	1.00	7	SE	SE	23.6	23.8	욮	Ħ	297	32.7
Vanadium	Sta6010	0.0400	/	SR	SZ	윺	욮	욮	H	2	0.0690
2inc	SW6010	0.0200	7	0.110	0.012	0.344	0.348	웊	X	욡	윺
Toluene	Su6020	-	/93	14,300	5	1(2)	1(3)	2	2(1)	4	윺
bis(2-Ethylhexyl)Phthalate	SWB270	£	7	SE	SE	2	₽	윺	H	5	7 7

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NT: analyte not tested MD: analyte not detected. MS: No standard criteria or action level currently exists. WOTES: Results reported for detected analytes only.

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.3-2 (continued)

				Standards C	riteria			# # # # # # # # # # # # # # # # # # #	
		Detection		and Action L	Levels (a)	3-A-3GU	3-A-4GU	3-A-5GV	
Parameter	Method	Limit	units	Federal	State	04/03/89	03/31/89	04/03/89	
Specific Conductivity	E120.1	:	Lambos/cm		8	752	300	321	
Temperature	E170.1	4/ 8	deg c	SN	SI	21.4	21.0	21.8	
3	£150.1		Ŧ		SN	7.06	7.34	7.07	
Alkalinity - Total	SPK 03	1.0	7/02	2	SN	81.2	82.2	83.6	
Bicarbonate	S# 403	1.0	<u>/</u>	SE	SH	. .8	100.3	102.0	
Total Dissolved Solids	E160.1	3.0	/02	200	200	92	305	282	
Chloride	E325.3	1.0	Š	220	220	33.7	7.97	24.6	
Fluoride	E340.2	0.050	7/0	~	1.4	0.24	0.26	0.24	
Mitrate + Mitrite	E353.3	0.050	7	10	45	7.8	8.6	5.2	
Sulfate	E375.4	1.0	7	220	220	8.7	9.1	7.7	
Colcium	State 010	8	>	SH	SH	19.7	20.6	25.8	
Magnesium	SW6010	<u>.</u> 8	7	SN	SH	9.13	9.39	12.3	
Potassium	SW6010	<u>-</u> 8	7	SE	SE	3.5	1.70	2.50	
Sodica	SW6010	 8.	7	SZ	SH	23.4	22.2	27.2	
Zinc	Stu6010	0.0200	70	0.110	0.012	3	욮	0.0220	
Toluene	SIMB020	•	7/87	14,300	901	웆	2	6(1)	
M-Witroscdiphenylamine (1)	SW8270	2	/ g	SH	S	7	2	Q	
***********************							*******		

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

NI: analyte not tested

ND: analyte not detected.

NS: No standard criteris or action level currently exists.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.3-2

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 3

Parameter Method Specific Conductivity E120.1 Temperature E170.1 E170.1 Alkalinity - Total SM403	Detection Limit 1.0	Unite				19 L	3-A-CGH	M17-V-C	1-A-04	3-A-404
•	1.0 #/A		Federal	State	BAFB-0634 09/08/89	BAFB-0633 09/08/89	BAFB-0639 09/13/89	BAFB-0678 B 11/03/89	BAFB-0635 09/11/89	BAFB-0636 09/12/89
	*			8	300	¥	89%	Ħ	727	311
	£ ;			S	21.5	21.5	21.0	Ħ	21.5	21.0
		7		S	7.39	7.40	7.90	Ħ	7.62	7.8
		į 7	20	¥	71.6	81.0	105.2	Ħ	78.9	76.0
	-	Ì	S	S	87.4	98.8	128.3		8	92.7
	, e	Ì	. S	200	544	250	326	Ħ	247	5 00
) -	Ì	ž	250	43.7	47.8	54.0		38.0	0.94
	- S	ì	} ^	7.	0.15	0.17	0.020	H	0.12	0.13
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bis(2-Ethy(hexy()Phthelate Su6270	2 2	3	S R	SE	3	17	₹	H	2	€

MIT: analyte not tested
MIT: analyte not tested in filed blank
MIT: analyte not tested
MIT: analyte not tested resistant
MIT: resample
MIT: resa

TABLE 4.1.3-2 (continued)

				Standards, Criteria and Action Levels (a)	Criteria Levels (a)	3-A-5GN		
	Method	Detection I fait	thits	Federal	State	BAFB-0637 09/12/89		
						1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
Contract Conference (Contract)	£120.1	0.5	unhos/cm	S	8	329		
	5170 1	**	dea C	S	N.S.	21.0		
	E150.1	*	7	5-9	KS	7.58		
Mikelinity . Total	20703	1,0	1/00	2	SE	83.8		
Ricerbonete	S14 03	0,	\ \ \ \	SE	S¥	102.2		
Total Dissolved Solids	F160.1	F	1/0	200	200	5 %		
	133	-	\	250	250	51.0		
	5 072	050	//	~	1.4	0.13		
Litrata + Mittita	F353.3	0.050	Ì	10*	45	5.6		
	1 1 1	-	7	250	220	8.3		
	2.65.10 10.10	5		¥.	SE	23.3		
	010975	8	/	S 2	SH.	10.5		
	010978	9	7	S	SH	2.70		
Sodium	S46010	8	Š	S	SE	22.4		
MOTES: Beaults reported f	or detected	analytes (solv.	•			1 1 1 1 1 1 1 1 1 1 1 1 1	
MI: analyte not tested			•	ä	inalyte det	analyte detected in blank	;	e: equipment wash blank
MD: enelyte not detected.				ä	stimated v	estimated value, below quantification limit	cation limit	f: field replicate
MS. We standard criteria	or action (evel currer	ntly exists	ق	ield blerk	field blank (ambient condition blank)	blank)	R: resample

NT: analyte not tested ND: analyte not detected. NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Table 4.1.3-3
RANGES OF CONTAMINANTS DETECTED AT SITE 3

CONTAMINANT - ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
SURFACE SOILS	• • • • • • •		**********	••••••
TFH-diesel	mg/kg	34	320	3/3
lead	mg/kg	67.5	88.6	3/3
bis(2-ethylhexyl) phthalate	mg/kg	1.4	1.6	3/3
di-n-buthyl phthalate	mg/kg	ND	0.59	1/3
xylenes	mg/kg	ND	0.007	1/3
SOIL BORINGS				
TFH-diesel	mg/kg	ND	23,000	29/55
TFH-gas	mg/kg	ND	5,100	26/55
mercury	mg/kg	ND	0.58	21/55
lead	mg/kg	ND	534	5/55
2-butanone	mg/kg	ND	(0.97)	20/55
toluene	mg/kg	ND	1.6	36/55
trichloroethene	mg/kg	ND	7.0	13/55
tetrachloroethene	mg/kg	ND	0.008	2/55
1,2-dichloroethane	mg/kg	ND	(0.069)	5/55
trans-1,2-dichloroethene	mg/kg	ND	0.85	2/55
ethylbenzene	mg/kg	ND	1.9	8/55
benzene	mg/kg	ND	(0.19)	4/55
xylenes (total)	mg/kg	ND	7.9	13/55
bis(2-ethylhexyl) phthalate	mg/kg	ND	(0.23)	4/55
di-n-butyl phthalate	mg/kg	ND	1.2	6/55
2-methylnaphthalene	mg/kg	ND	6.8	9/55
4-methyl-2-pentanone	mg/kg	ND	0.87	3/55
phenanthrene	mg/kg	ND	(0.15)	2/55
napthalene	mg/kg	ND	5.2	5/55
GROUNDWATER				
TFH-gas	mg/t	ND	0.10	1/12
arsenic	mg/l	ND	0.012	2/12
toluene	ug/l	ND	6.0	3/12
bis(2-ethylhexyl) phthalate	ug/l	ND	17.0	3/12

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

detected in some soil samples were tentatively identified below the LOQ. Some of these detections may represent laboratory "noise," and the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.3.2 Sampling and Analytical Problems

4.1.3.2.1 Loss of Samples

There were no sample loss problems for Site 3 samples. One soil sample was resampled due to a holding time violation for mercury. One water sample in the second semiannual round was resampled because of a holding time violation for purgeable halocarbons and purgeable aromatics. All scheduled analyses were completed for Site 3 samples.

4.1.3.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 3 contained several organic compounds that were probably laboratory- or field-induced false positive results. Many of the soil samples collected contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks at similar concentrations.

Several soil samples contained the semivolatile compounds bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and N-nitrosodiphenylamine. These compounds were also detected in some of the method blanks at similar concentrations. The phthalate compounds were commonly detected in samples from throughout the base and are probably false positive results.

Phenol was detected in over half of the soil samples at concentrations ranging from 0.97 mg/kg to 2.3 mg/kg, with all but two of the detections in the range of 1.1 mg/kg to 2.3 mg/kg. Phenol contamination in soil samples has been traced to a factory contaminated bottle of acetone used in the method extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Toluene was detected in most of the soil samples. This occurred for samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is a false positive

result in most cases. Where toluene is believed to actually be present, such as at FPTA No. 1, it is discussed in the text.

Four field replicate QC soil samples were collected at Site 3. For the most part, the analytical results are very similar, with the exception of toluene (discussed above) and one TFH-diesel with an RPD of 161 percent. In addition, TFH-gas, xylenes, and 2-methylnaphthalene were detected in one sample but not confirmed in the corresponding replicate sample.

During the first sampling round, one groundwater replicate sample was collected at well 3-C-1, as well as one equipment wash blank and one ambient condition blank. Replicate results were very comparable, except for TFH-gas, which was detected in the replicate at the LOQ and not in the normal sample. The equipment wash blank had TDS of 37 mg/l, which is higher than expected for deionized water. The ambient condition blank had toluene detected at 2 ug/l (1 ug/l in the second column), with a detection limit of 1 ug/l. Toluene was detected both in the normal environmental sample at 1 ug/l (2 ug/l in the second column) and in the field replicate at 1 ug/l (3 ug/l in the second column), but not in the equipment wash blank.

4.1.3.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 3 samples.

4.1.3.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.3.3 Significance of Findings

TFH-diesel and -gas were detected in borings from all four areas at Site 3: FPTA No. 1, FPTA No. 2, the overflow basin, and underground storage tanks (see Figure 4.1.3-8).

Volatile organics were detected i soil samples from all four areas at Site 3 (Figure 4.1.3-10). Two semivolatile organic compounds were detected in samples from all four areas at Site 3, although only three samples had concentrations above the LOQs (Figure 4.1.3-9). Other than lead, the ICP metal concentrations detected at Site 3 were generally within the range of those detected in soil samples from other sites on base. The detection limits for lead ranged from 20 mg/kg to 25 mg/kg. Lead was detected in the surface

sample from the background boring at 24.2 mg/kg, as shown in Figure 4.1.3-9 which indicates that leaded fuel may have been spilled there at some time.

FPTA No. 1

In the FPTA No. 1 area, TFH-diesel concentrations ranged from 5.7 to 23,000 mg/kg and was detected in 18 of 22 soil samples collected from the four 20-foot borings. TFHs were detected in samples from all sampling depths in the FPTA No. 1, including 20 feet (the deepest). At this sample depth, TFH-diesel concentrations were from 94 to 1,300 mg/kg and TFH-gas concentrations were from 260 to 1,800 mg/kg. In 3-C-3SB, the TFH concentrations were greater in the 20-foot sample than in the surface sample.

The contaminated area at FPTA No. 1 is estimated to be a circle approximately 60 feet in diameter. Contamination migrating downward under the influence of gravity should move predominantly vertically but may spread beyond the original area due to dispersion around soil particles and/or flow along low permeability boundaries. The vertical extent of TFH contamination below the depth of samples taken is unknown and estimating the depth of contamination at FPTA No. 1 by comparison with other areas of Site 3 which have both TFH contamination and deeper borings is not appropriate. The lack of a liner system or prewetting operations during fire training at FPTA No. 1 has apparently facilitated greater infiltration of TFH into the soil than at FPTA No. 2.

In FPTA No. 1, xylenes and TCE were detected in three of the four borings. Total xylenes were detected at concentrations from 0.046 to 7.9 mg/kg at depths below ground surface of zero, 5, 10, and 15 feet. Total xylenes were not detected at greater depths in any other borings at Site 3. quantified at depths of 10, 15, and 20 feet, and estimated below the LOQ at a depth of 5 feet. The concentration at 20 feet was 0.14 mg/kg. TCE was detected at lower concentrations at greater depths in other borings on Site 3. The lateral extent of volatile organic contamination at FPTA No. 1 is believed to approximate the edges of the contamination source areas. The vertical extent of xylene contamination is believed limited to depths below ground surface of 15 feet. The vertical extent of TCE contamination cannot be determined based on the soil investigation performed at FPTA No. 1. No DHS TTLC for xylenes is available. The LUFT xylene cleanup standard computed for this site is 1 mg/kg. The DHS TTLC for TCE is 2,040 mg/kg.

Toluene was detected in samples from all four borings at FPTA No. 1. Many of the samples are at levels below 0.05 mg/kg and may represent false positive results. However, several samples range from about 0.1 to greater than 1 mg/kg and probably represent actual toluene contaminated sils. Boring 3-C-7SB had toluene detected at from 0.2 to 0.77 mg/kg in the surface 10-, 15-, and 20-foot samples but only 0.028 mg/kg at 5 feet. Ethylbenzene and xylene were detected in all but the 5-foot sample. Boring 3-C-3SB had toluene detected at from 0.76 to 1.6 mg/kg in the 0- to 1.5-, 5- to 6.5-, and 15- to 16.5-foot samples, which is probably true contamination. Ethylbenzene and xylene were only detected in the surface sample.

In FPTA No. 1, 2-methylnaphthalene was detected at 6.8 mg/kg at a depth of 10 feet in 3-C-2SB. Naphthalene was detected in the surface sample in boring 3-C-7SB at 5.2 mg/kg. Both compounds were detected in other samples at levels below the LOQ.

Naphthalene and 2-methylnaphthalene are constituents of jet fuels JP-5 and JP-8 (AFESC, 1981), and may also be constituents of other jet fuels. Although no evidence indicating use of JP-5 and JP-8 at Beale AFB was encountered, the presence of naphthalenes in soil samples from beneath the fire training area is not unexpected.

Lead was detected in three surface samples from the FPTA No. 1 at concentrations of 240, 251, and 534 mg/kg. One sample from a 5-foot depth in 3-C-7SB had a lead concentration of 61.5 mg/kg. The DHS TTLC for lead in soil is 1,000 mg/kg. Based on this criteria, the detected lead levels at FPTA No. 1, although relatively high for the base, do not constitute a hazardous waste.

FPTA No. 2

TFH-diesel and -gas were detected in soil samples from angled borings beneath the FPTA No. 2 to a maximum 17.5- to 19-foot sample depth (actual vertical depth equals 16 feet). TFH-diesel concentrations ranged from 8.8 to 9,400 mg/kg in five samples; TFH-gas concentrations ranged from 39 to 700 mg/kg in four samples. The highest concentration for each TFH was detected in the 17.5- to 19.0-foot sample (actual vertical depth equals 16 feet) from 3-C-10SB. No TFHs were detected below this depth in either boring. Each angled boring had a total vertical depth of 42 feet. In these borings, the vertical extent of TFH contamination is estimated to be 15 to 20 feet. The LUFT TFH-diesel and gas cleanup standards are 1,000 mg/kg and 100 mg/kg.

In angled boring 3-C-10SB in FPTA No. 2, xylenes, benzene, TCE, and trans-1,2-DCE were detected. The xylene concentrations were 0.73 mg/kg at zero feet and 0.041 mg/kg at 17.5 to 19 feet (actual vertical depth 16 feet). Benzene was detected in the surface and 17.5- to 19-foot samples at 0.041 and 0.022 mg/kg. Toluene was detected at 0.40 mg/kg in the surface sample, 0.065 mg/kg at 7.5 to 9 feet, 0.18 mg/kg at 17.5 to 19 feet, 0.029 mg/kg at 27.5 to 29 feet, 0.096 mg/kg at 37.5 to 39 feet, and 0.19 mg/kg at 47.5 to 49 feet. The surface and 17.5- to 19-foot results probably represent actual toluene contamination as the concentrations are higher than other samples and benzene and xylenes were also detected in these two samples. TCE was detected in all except the surface sample ranging from 0.011 to 0.49 mg/kg. The 0.011 mg/kg concentration was in the deepest (42 feet) sample. Trans-1,2-DCE was detected in the surface and 7.5-foot samples at 0.85 and 0.033 mg/kg. The LUFT cleanup standards for xylene and benzene are 1.0 and 0.3 mg/kg. The DHS TTLC for TCE is 2,040 mg/kg; none is available for DCE.

Semivolatile organic compounds were detected in angled boring 3-C-10SB in the FPTA No. 2. Samples from the surface and 17.5 to 19 feet had concentrations of 2 methylnaphthalene and naphthalene below the LOQ.

The surface samples from two angled borings in FPTA No. 2 had lead concentrations of 34.9 and 69.0 mg/kg.

Overflow Basin

Beneath the overflow basin, TFH-diesel and -gas were detected at 470 and 190 mg/kg in the 8-foot soil sample (actual vertical depth equals 7 feet) from angled soil boring 3-C-5SB. TFH-diesel was also detected at concentrations from 34 to 320 mg/kg in the three sediment samples collected from the overflow basin. In the angled boring drilled, the vertical limit of TFH contamination is estimated to be 7 to 10 feet.

Three volatile organic compounds were detected in soil samples from angled boring 3-C-5SB beneath the overflow basin. Xylenes were detected in the 7.5- to 9-foot sample (7 feet vertically) at 1.8 mg/kg. TCE was detected in the 27.5- to 29-foot sample (24 feet vertically) at 0.017 mg/kg and was estimated in the 47.5- to 49-foot sample (42 feet vertically) below the LOQ. 1,2-DCE was detected at 0.020 mg/kg in the 27.5- to 29-foot sample and below the LOQ in the 47.5- to 49-foot sample. Xylene was detected at 0.007 mg/kg in sediment sample 3-C-3SS. The LUFT cleanup standard for xylene is 1.0 mg/kg.

Mercury was detected in soil samples to a vertical depth of 42 feet at concentrations from 0.070 to 0.088 mg/kg beneath the overflow basin. The DHS TTLC for mercury is 20 mg/kg.

The three sediment samples from the overflow basin had lead detected at 67.5, 67.7, and 88.6 mg/kg. No lead was detected in soil samples from the angled boring beneath the overflow basin. The DHS TTLC for lead is 1,000 mg/kg.

Underground Storage Tanks

TFH-diesel and-gas were also detected in the two vertical borings near the underground storage tanks. Soil samples above a depth of 15 feet ranged in concentrations from 630 to 3,800 mg/kg for TFH-diesel and 240 to 1,700 mg/kg for TFH-gas in three samples. The concentrations in samples from 20 feet were relatively low compared to the FPTA areas; 5.1 mg/kg for TFH-diesel in 3-C-6SB and 47 mg/kg for TFH-gas in 3-C-4SB. The soil samples from 30 feet had concentrations of 11 and 280 mg/kg for TFH-diesel and 44 and 150 mg/kg for TFH-gas in borings 3-C-4SB and 3-C-6SB, respectively. The boring 3-C-6SB sample from 40 feet had 180 and 72 mg/kg TFH-diesel and -gas concentrations. Boring 3-C-4SB had 38 mg/kg TFH-gas in the deepest (50 feet) sample. The LUFT cleanup standards for TFH-diesel and -gas at Site 3 are 1,000 mg/kg and 100 mg/kg. The lateral extent of this contamination is likely limited to the immediate area of the underground tanks. While the TFH concentrations appear to decrease with depth, its limits are still unknown.

In the two borings near the underground storage tanks, xylenes were detected in two samples from boring 3-C-4SB. Xylene concentrations of 3.8 and 1.4 mg/kg were detected in the surface and 10-foot samples. The LUFT cleanup standard for xylene is 1.0 mg/kg.

In the 10-foot sample from boring 3-C-6SB, 2-methylnaph-thalene was detected at 0.84 mg/kg near the underground storage tanks. It was also detected below the LOQ in boring 3-C-4SB.

No lead was detected in soil samples from the underground storage tank area.

Groundwater

Only TFH-gas (0.10 mg/l, 3-C-1, first round replicate sample) was detected in groundwater sampled in the two semi-annual rounds at Site 3. Because of the lack of confirmation in the normal sample or subsequent semiannual samples, the TFH-gas detection is suspect. Toluene and bis(2-ethylhexyl) phthalate detected in the groundwater from this site

are not believed to be contaminants. Arsenic was detected in samples from background well 3-A-2 in both rounds at 0.0110 and 0.0120 mg/l. This is below the federal and state MCL of 0.05 mg/l. As well 3-A-2 is an upgradient well for Site 3, the arsenic is believed to be naturally occurring.

4.1.3.3.1 Zones of Contamination

At Site 3, the zones of contamination are believed to be limited to the four areas investigated in Stage 2-1, as discussed above. The Phase II, Stage 1 study detected oil and grease contamination at FPTA No. 2 and near the underground storage tanks. Stage 2-1 confirms and further delineates the extent of contamination at these areas and also provides new information in the FPTA No. 1 area and the overflow basin.

In all four areas the lateral extent of soil contamination is judged to be limited approximately to the boundary of the structure(s) which act as the contaminant source. Groundwater is approximately 110 feet below the ground surface at Site 3. Contamination migrating downward under the influence of gravity should move predominantly vertically but may spread beyond the original area due to dispersion around soil particles and flow along low permeability boundaries.

FPTA No. 1

The apparent vertical extent of soil contamination in FPTA No. 1 cannot be determined from the investigation conducted in Stage 2-1 because TFH-diesel and -gas were detected in the deepest samples from three of the borings in the area.

FPTA No. 2

Based on the two borings drilled beneath the FPTA No. 2 during Stage 2-1, the vertical extent of TFH soil contamination is limited to the 16-foot vertical sample depth. TCE soil contamination is present at the 42-foot vertical sample depth and may extend deeper. However, the TCE concentrations generally decreased within the depth investigated.

Overflow Basin

The apparent vertical extent of TCE and 1,2-DCE, based on one angled soil boring completed in Stage 2-1, is about 30 feet. Since mercury was detected in the deepest sample from 3-C-5SB, the lower limit of detectable mercury concentrations cannot be estimated beneath the overflow basin.

Underground Storage Tanks

The vertical extent of contamination in the underground storage tank area is at least 50 feet. The TFH-gas contamination is believed to extend beyond this depth, although the TFH concentrations do decrease with depth. The lower limit of soil containing detectable levels of TFHs cannot be determined from the work conducted through Stage 2-1.

Total xylenes and 2-methylnaphthalene were detected in two borings at the 10-foot depth near the underground storage tanks. Volatile and semivolatile compounds were not detected below this depth.

Groundwater

Contamination was not detected in the groundwater at Site 3 during the Phase II, Stage 1 work. Through the two rounds of sampling (semiannual at Site 3) in Stage 2-1, only TFH-gas was detected (at the LOQ) in one replicate sample.

4.1.3.3.2 Contaminant Migration

No significant groundwater contamination has been detected at Site 3 and no surface water other than direct runoff leaves Site 3. While the likelihood for contaminant migration is low, contaminants in the soil may continue to move downward to groundwater. Contaminants (if any) in the groundwater would move with the regional groundwater flow to the west.

4.1.3.3.2.1 Potential to Move Off Site and Off Base

At present, contaminants at the levels detected at Site 3 are not expected to move off the site or off the base. Based on drainage ditch sediment samples collected during Phase II, Stage 1, surface water apparently does not transport contaminants from Site 3.

The potential for TFH-gas detected in one replicate ground-water sample to move off site and off base is considered low.

4.1.3.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Groundwater flows west from Site 3 at approximately 150 feet per year.

4.1.3.3.2.3 Time of Travel to Receptors

The potential receptors include firefighters in training (discontinued) and base personnel handling wastes. Travel to off base receptors is unlikely.

4.1.3.3.2.4 Applicability of Solute Transport Models

Due to the complex alluvial deposits and lack of detected analytes in the groundwater, solute transport models are not applicable at Site 3.

4.1.3.3.2.5 Expected Spatial and Temporal Variations in Concentration

Spatial or temporal variations in groundwater chemistry were not detected in the two semiannual sampling rounds at Site 3.

4.1.3.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.4 DISCUSSION OF RESULTS FOR SITE 4: BATTERY SHOP DRY WELL

From 1972 to 1983, approximately 24 gallons per month of neutralized lead battery acid were discharged to the dry well, which is adjacent to the battery shop (Building 1088; see Figure 4.1.4-1). Over 11 years, an estimated 3,200 gallons were discharged. The neutralized acid may have had high lead concentrations. The dry well is 4 feet in diameter, approximately 20 feet in depth, and filled with cobblestones. Use of the dry well was discontinued in 1983.

One angled soil boring was drilled beneath the dry well to determine soil pore fluid characteristics, soil pH, and ICP metal concentrations.

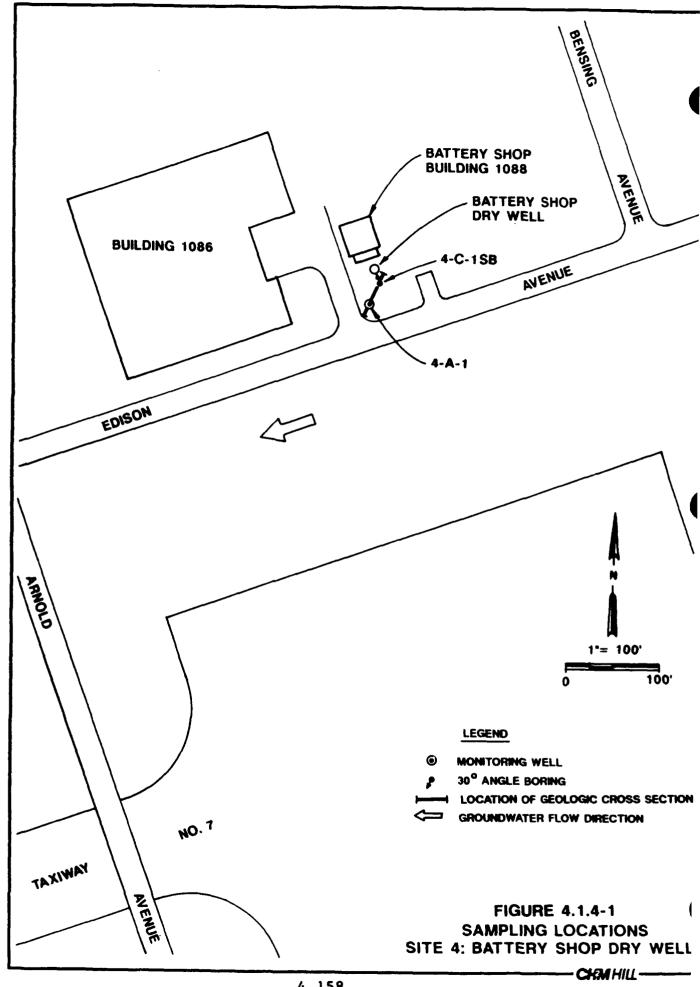
4.1.4.1 Presentation of Results

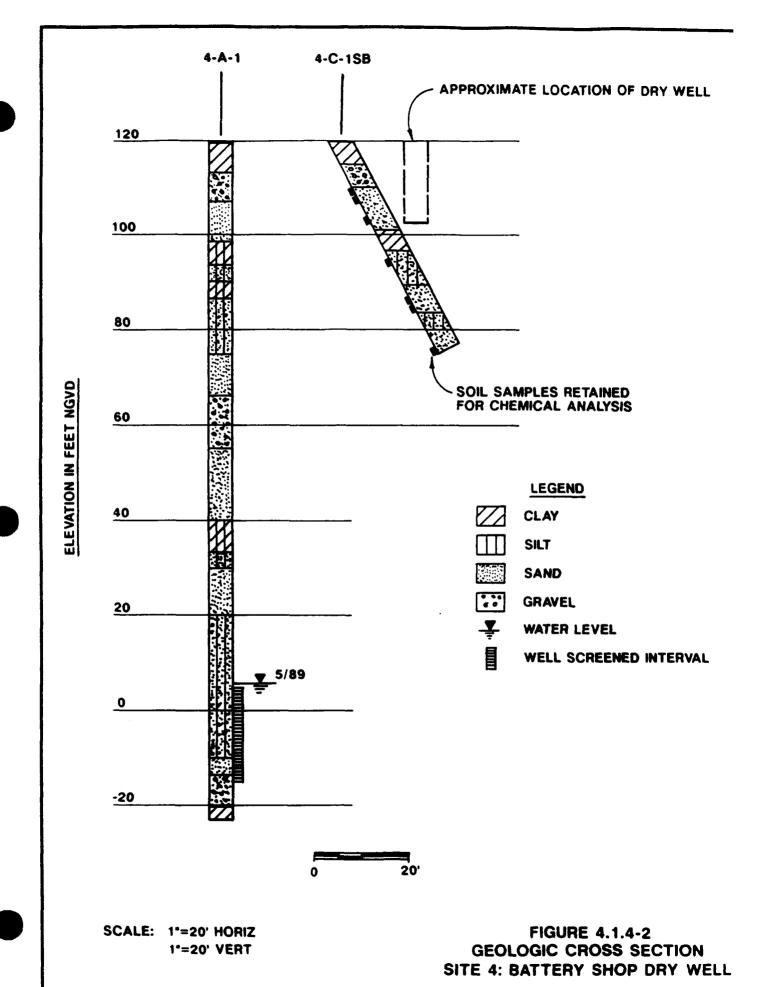
This section presents the results of the field investigation at Site 4. The discussion focuses on the geology and hydrogeology at the site and presents the results of chemical analyses performed on samples of groundwater and soils.

4.1.4.1.1 Site Geology

Evaluation of the geology at Site 4 is based on a borehole drilled during the current Stage 2-1 investigation and on a well installed during the Phase II, Stage 1 investigation (AeroVironment, 1987). During the current investigation, one angled soil boring was drilled at Site 4 beneath the battery shop dry well to a depth of 49 feet (vertical distance of 42 feet). During the Phase II, Stage 1 investigation, one monitoring well was constructed at Site 4 and screened across the water table. The locations of the well and borehole are shown in Figure 4.1.4-1. Soil boring logs are provided in Appendix D.

A cross-section constructed from soil boring logs of the Site 4 well and borehole is shown in Figure 4.1.4-2. A key to lithologic symbols is given in Appendix D. This cross-section shows that near-surface soil in the vicinity of Site 4 is predominantly fine-grained clay, becoming mainly coarse-grained sand and silty sand below a depth of about 5 feet. Because the borehole and well were drilled only about 24 feet apart, the geologic units may be correlated between the holes. The cross-section shows sand through almost the entire interval of both holes, varying from silty sand to sandy gravel at about the same depth intervals. Lenses of clay and silty clay are present within the sand units. The borehole in which well 4-A-1 was constructed was terminated in a clay unit at a depth of about 140 feet





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(-20 feet NGVD). However, the extent of this unit and its impact on hydraulic characteristics of the groundwater are unknown.

Soils at Site 4 constitute an alluvial sequence. At the surface, the deposits at Site 4 have been mapped as belonging to the Laguna Formation (Page, 1980). These are continental alluvial deposits of the Pleistocene and Pliocene Epoch composed of clay, silt, sand, and gravel and are pre-dominantly coarse-grained deposits. These deposits overlie the older volcanic rocks from the Sierra Nevada in the stratigraphic section at Beale AFB. The volcanic rocks outcrop about 1 mile east of Site 4 in the foothills (Page, 1980). Based on the colors described in the logs of the boreholes, no volcanic material was encountered in borings at Site 4.

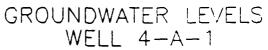
4.1.4.1.2 Site Hydrogeology

The first saturated permeable zone in well 4-A-1 that produced water during drilling occurred at a depth of about 124 feet (-5 feet NGVD) as the cuttings became increasingly wet in a silty fine sand unit. After completion and development of this well, the water level remained at about -5 feet NGVD. It is likely that the groundwater is unconfined in the sand units that lie under Site 4. The nearest clay unit lying over the groundwater occurs at an elevation of 33 to 40 feet NGVD. As described above, the sands are underlain by a clay unit at a depth of about 140 feet (about -21 feet NGVD).

Groundwater levels in well 4-A-1 between April 1986 and November 1989 are summarized in Table 4.1.4-1 and Figure 4.1.4-3. This table shows that the groundwater level in this well has risen over 13 feet during this period. This rise corresponds to a regional water level rise observed in other shallow monitoring wells in the vicinity and may be due to a reduction in agricultural pumping west of the base or to an increase in regional recharge. The water level rose over 3 feet between December 1988 and November 1989.

GROUNDWA		4.1.4-1 VATIONS:	SITE	4	
Oct.	Dec.	Feb.	March	May	Aug.

Well	Screened <u>Interval</u>		Oct. 1986			March 1989		Aug. 1989	Nov. 1989
4-A-1	5 to -15	-5.81	-3.59	4.46	4.73	5.43	5.94	7.10	7.71



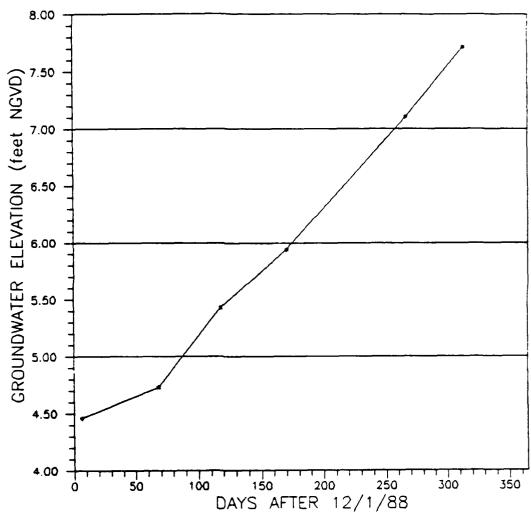


FIGURE 4.1.4-3
MONITORING WELL HYDROGRAPH
SITE 4: BATTERY SHOP DRY WELL

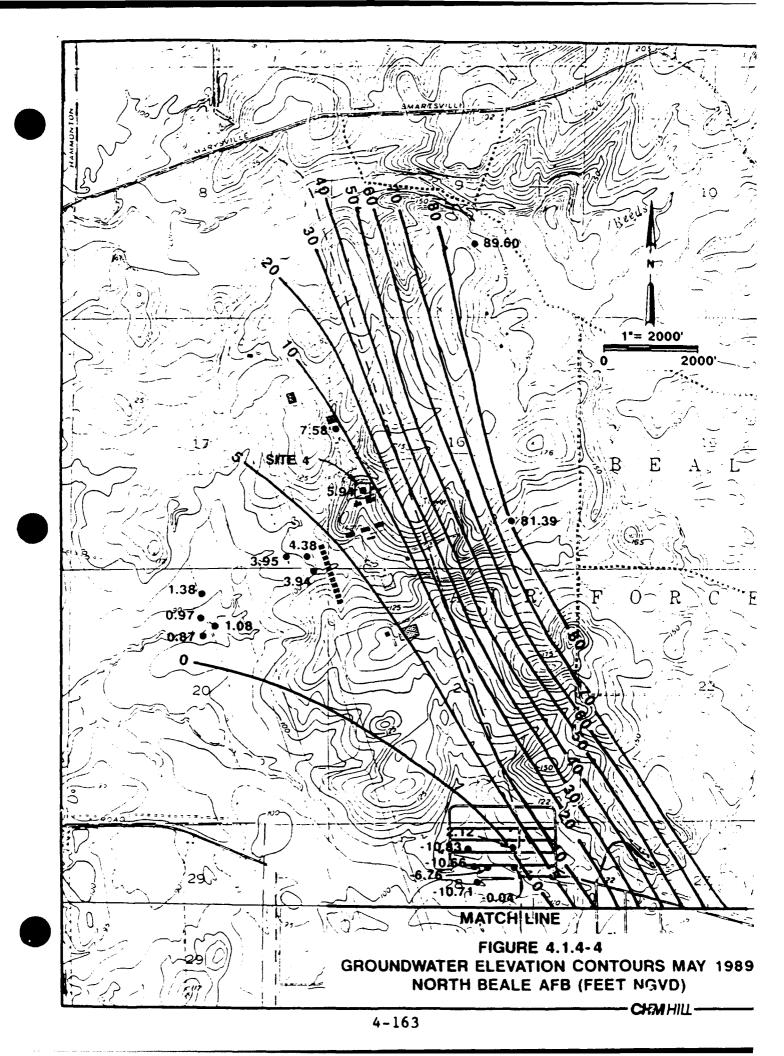
Contours of groundwater levels taken in May 1989 from monitoring wells screened across the water table in the flightline area of Beale AFB are plotted in Figure 4.1.4-4. Groundwater levels taken across Beale AFB in March and November 1989 are plotted in Plates 3 and 4. Groundwater contours drawn on these levels show that groundwater flows toward the southwest in the vicinity of Site 4. The gradient increases to the east of well 4-A-1, from about 0.003 to about 0.02. This change appears to be in response to a change in hydrogeologic regimes from unconsolidateu sediments of the Central Valley to consolidated rocks of the Sierra Nevada foothills. The change is also an artifact of the bending of flowlines toward the groundwater depression west of Beale AFB. Aquifer parameters in the immediate vicinity of Site 4 are unknown because no tests were performed on existing well 4-A-1 during the Stage 2-1 investigation.

4.1.4.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are in Appendices A and F. Discussion of analytical results in this and following subsections and presentation of analytical results in figures and tables are limited to results that are indicators of site-specific contamination. Though not all analytes are individually discussed or illustrated, all are presented in the Analytical Results Table in Section 4.1.4.1.4 and in Appendix A.

Five soil boring samples and two duplicates were collected at Site 4 (Figure 4.1.4-1) from the 50-foot angle boring, 4-C-ISB, beneath the 20-foot-deep cobble-filled battery shop dry well. These soil boring samples were analyzed for ICP metals (6010), soil moisture (ASTM D2216), soil pH (9045) and TFH-diesel and -gas (California method). Due to the nature of wastes disposed at this site, no additional organic analyses were performed.

ICP metals in the 17.5- to 19- and 37.5- to 39-foot (16 and 33 feet vertically) samples at boring 4-C-ISB contained lower levels of aluminum, calcium, iron, magnesium, manganese, and zinc than the 11-foot (10 feet vertically) sample or background levels at Beale AFB. Aluminum, iron, and zinc were at low levels in the 37.5- to 39- and 47.5- to 49-foot samples (33 and 42 feet vertically), as well. The following metals were detected at concentrations greater than two standard deviations above background levels: barium in the 27.5- to 29- and 37.5- to 39-foot samples, manganese in the 27.5- to 29-foot through 47.5 to 49-foot samples, and sodium in all samples. Only the 17.5- to 19-foot sample had



detected cadmium (2.7 mg/kg) and lead (110 mg/kg). Beryllium was detected in the 27.5 to 29-foot sample at 1.1 mg/kg. It was only detected in 1 of 31 background samples at 0.62 mg/kg. Soil pH ranged from 6.2 to 7.4 except in the 27.5- to 29-foot sample, which had a pH of 3.6. TFH-diesel and -gas were not detected.

During the IRP Phase II, Stage 1 investigation (AeroVironment, 1987), TCE was detected in well 4-A-1 at 0.2 ug/l in the April and 0.1 ug/l in the October 1986 sampling rounds. Barium was detected at $0.060~\rm mg/l$ in the first round and at 0.250 mg/l in the second round.

In the two Stage 2-1 semiannual rounds of water sampling at Site 4, one groundwater sample was collected during each round from monitoring well 4-A-1 installed by AeroVironment in 1986 (Fig. 4.1.4-1). Analyses performed for the water samples were ICP metals (6010), lead (7421), water quality parameters, and TFH-diesel and -gas.

Lead, TFH-diesel, and TFH-gas were not detected in ground-water at Site 4 during the first semiannual sampling round of this investigation (April 1989). TDS was 161 mg/l in 4-A-1. Major anions and cation concentrations were generally similar to other sites near the flightline. Nitrite plus nitrate (expressed as nitrate) was 12.5 mg/l. Sulfate is lower than at most areas at Beale AFB at 3.8 mg/l. Fluoride was 0.32 mg/l. Groundwater at Site 4 is a sodium-calcium bicarbonate type.

In the second sampling round at Site 4 (September 1989), results were very similar to results of the first round. Again, lead, TFH-diesel, and TFH-gas were not detected. Water quality parameters and type were similar to those of the first round. Sulfate dropped to 1.2 mg/l.

4.1.4.1.4 Analytical Results Table

Table 4.1.4-2 presents a summary of all analyses and detected analytes for Site 4. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.4-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

TABLE 4.1.4-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 4

				and Action	Levels (a)	BAFB-0409	BAFB-0410	BAFB-0411		BAFB-0413	BAFB-0414
Parameter	Method	Detection Limit	Units	Federal	State	11.0-12.5	12.5-14.0 ¹ 01/17/89	17.5-19.0° 01/18/89	27.5-29.0° 01/18/89	37.5-39.0° 01/18/89	39.0-40.5
Percent Moisture	ASA#9	V/N	><	SE	SE	23.9	22.4	24.9	21.6	13.7	12.2
Soil PH	SN9045	N/N	4/ 8	5-9	SZ	6.2	6.2	7.6	3.6	4.9	H
	SW6010	20.0	mo/ka	SH	SE	18100	15200	2650	15400	6340	2440
	SW6010	10.0	mo/kg	SH	10,000	251	213	154	695	765	286
Beryllium	Su6010	0.50	MQ/kg	SE	ĸ	윤	2	۽		2	€
Cachaium	Su6010	1.0	mo/kg	SH	5	욮	2	2.7	2	2	2
Calcius	Su6010	5	mo/kg	SH	SE	4550	4200	1460	2320	1710	1660
Chromica	Su6010	3.0	MQ/kg	SN	200	11.0	9.5	10.0	47.2	7.1	4.9
Cobelt	Su6010	0.4	mg/kg	S#	8,000	13.0	11.0	9	16.6	5.0	4.9
Cocoer	SW6010	3.0	mg/kg	SH	2,500	22.3	26.9	28.1	27.6	13.9	7.3
l ron	SW6010	10.0	MQ/kg	SN	SN	22500	18200	16100	25100	06 %	8510
Lead	Su6010	20.0	mo/kg	SM	1,000	₩	₽	110	윺	욮	2
Magnesium	Su6010	5	mg/kg	SE	SN	3310	2890	1120	2360	2380	2060
Mandanese	Su6010	1.5	mg/kg	SH	SX	1190	Š	 7.	2930	2320	1320
Mickel	SW6010	4.0	mg/kg	SH	2,000	10.6	7.5	웊	8.62	9.9	4.7
Potassium	SW6010	200	MO/kg	SH	SE	2	2	533	1390	1010	877
Sodius	Su6010	5	MQ/kg	S#	SN	874	8	2380	1160	269	505
Thetties	SW6010	50.0	mg/kg	SH	902	2	2	2	욮	24.7	1 23.0
Venedium	SW6010	0.4	MQ/kg	SN	2,400	45.6	36.6	6.44	68.2	19.7	15.9
Zinc	Su6010	2.0	mg/kg	S¥	2,000	66.5	51.4	36.1	53.3	28.1	19.4

MT: analyte not tested

MD: analyte not detected.

MD: field blank (ambient condition blank)

MD: values listed in () are 2nd column confirmation values.

MD: values represent most stringent standard, criteria or action level. See Appendix I.

MD: The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

MD: Analysis are given in Appendix A.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.4-2 (continued)

				Standards, Criteria and Action Levels (a)		4-C-158 BAFB-0415	
Parameter	Method	Derection Limit	Units	Federal	State	01/18/89	
Percent Moisture	O#VSV	4/8	×	SE	SE	14.6	
Soil PH	SN9045	4/	4/8	2-9	SE	6.3	
Alian	S46010	20.0	mo/ka	SE	SN.	11200	
Recita	Su6010	10.0	mo/kg	SE	10,000	121	
Calcium	SW6010	5	mo/kg	SN	SH	3780	
Chromina	SW6010	3,0	Ma/ka	SE	200	6.9	
Cobalt	S146010	0.4	mo/ka	SE	8,000	5.0	
Conner	Su6010	0.E	mo/kg	SN	2,500	11.7	
1500	SN6010	10.0	a/kg	SE	SE	7740	
Magnesium	S16010	2	mo/kg	SN	¥	1790	
Mandanese	S146010	1.5	Mo/kg	SX	S	627	
Potasium	SW6010	900	Ma/kg	SZ	SZ	457	
Sodium	S146010	5	mo/kg	SE	SE	802	
Thattie	SW6010	50.0	mo/ko	SZ	92	15.2	
Vanedium	SW6010	0.4	mo/ko	SN	2,400	14.1	
Zinc	SW6010	2.0	10 /kg	SN	2,000	16.4	

MT: analyte not tested

With analyte not tested

With analyte not detected.

With analyte not detection limits is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

TABLE 4.1.4-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE

				Standards, Criteria	Criteria evels (a)	4-A-16U
Parameter	Method	Detection Limit	Saits	Federal	State	BAFB-0525 04/04/89
Specific Conductivity	E120.1	- -	MID/SOUTH	Ş	8	291
Temperature	E170.1	∀ /≅	deg C	S	SI	21.0
7	E150.1	X / X	*	2-9	SE	9.7
Alkatinity - Total	SH403	1.0	7/500	8	SN	8.38
Bicarbonate	204403	1.0	70	SE	SX	81.5
Total Dissolved Solids	E160.1	3.0	7	200	200	191
Chloride	£325.3	1.0	7	250	250	6.5
Fluoride	E340.2	0.050	1/0	~	1.4	0.32
Witchte + Witchte	E353.3	0.050	/0	Ç	45	12.5
Sulfate	E375.4	0.	7	250	250	3.8
	Succoso	1.00	/0	SE	SE	10.6
Macrostia	SUKO10	1.00	1/0	SX	SE	5.83
Potassium	SIA6010	9.	/02	S¥	SZ	2.8
Sodium	SW6010	2.8	7/04	SN	SX	18.9

MOTES: Results reported for detected analytes only.

WI: analyte not tested

WI: analyte not detected

WI: analyte not detected

WI: analyte not detected.

WI: analyte not detected in limit for action level setimated value.

WI: analyte not detected.

WI: field replicate

WI: resample

WI: resample

WI: for Mitrate + Mitrite given as Mitrate

WI: for Mitrate + Mitrite given in Appendix A.

WI: for Mitrate + Mitrite given in Appendix A.

WI: for Mitrate + Mitrite given in Appendix A.

TABLE 4.1.4-2

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE

				Standards, (Criteria		
				and Action I	Levels (a)	4-A-164	
		Detection	_			BAFB-0628	
Parameter	Method	Limit		Federal	State	09/01/89	
Specific Conductivity E1	E120.1	1.0	Callos/Ca	SE	906	172	
Temperature	E170.1	X / X	ပ (ရှင်	SE	SE	21.5	
	E150.1	X / X	₹.	2-9	SN	4.49	
Alkalinity - Total	504403	1.0	1/0	8	SN	59.6	
Ricarbonate	24403	1.0	2	SN	SE	7.2	
Total Dissolved Solids	£160.1	0.5	- N	200	200	176	
Chloride	E325.3	1.0	- / <u>Q</u>	250	250	9.8	
Firstide	E340.2	0.050	Ž	~	1.4	0.26	
Mitcate + Mitrite	E353.3	0.050	<u> </u>	•	\$	12.9	
Sulfate	E375.4	1.0	/02	250	250	1.2	
Calcium	Su6010	8.	7	SN	SE	10.2	
Megnesium	Su6010	1.00	7	SE	SZ	5.36	
Potassica	Su6010	- 8:	7	SE	SZ	1.07	
Sodium	SW6010	. 8.	1/02	S	SE	17.1	
		,					

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: No standard is and standard, criteria or action level. See Appendix I.

MS: No standard is action level or action level.

MS: No standard is action level or action level.

MS: No standard is action level or action level.

MS: No standard is action level or action level.

MS: No standard in level or action level.

MS: No standard in level or action level.

MS: No standard in level or action level.

MS: No standard or level or level or action level.

MS: No standard or level or level or action level.

MS: No standard or level or level or action level e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. MD: analyte not detected. NT: analyte not tested

4.1.4.1.5 Discussion of Analytical Data

The only suspected heavy metal contaminant detected at Site 4 was lead, which was encountered in the angled soil boring (15 feet vertically) from a sample depth of 17.5 to 19.0 feet at a concentration of 110 mg/kg. Soil pH was 3.6 at a sample depth of 27.5 to 29.0 feet (24 feet vertically), but was within one pH unit of neutral for all other samples. Sodium was also encountered in all soil samples at greater than two standard deviations above background concentrations.

No data corrections have been made based on method blank detections. Analytical data are believed to accurately represent site conditions at the time of sampling.

4.1.4.2 Sampling and Analytical Problems

4.1.4.2.1 Loss of Samples

There were no sample loss problems for Site 4 samples. The only omitted analysis was one soil pH for the sample from 39.0 to 40.5 feet (34 feet vertically). The omission of this analysis is not considered critical to the final evaluation of site conditions because the omitted analysis is for a replicate sample. The pH was determined for the original sample from 37.5 to 39.0 feet (32.5 feet vertically).

4.1.4.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

No organic analyses were conducted for Site 4 other than for TFH-diesel and -gas. None of the analytes detected are suspected of being false positive results.

Two soil replicate QC samples were collected from the boring at Site 4. Both of the replicate analyses were comparable with the original samples for all analytes.

4.1.4.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 4 samples.

4.1.4.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.4.3 Significance of Findings

Soil

No TFH-diesel or -gas was detected in any soil samples from boring 4-C-ISB. Soil pH ranged from 6.2 to 7.6 in most samples, except for the sample at 27.5 feet (actual depth equals 24 feet) which had a pH of 3.6. This sample was collected from approximately directly below the backfilled dry well and is interpreted to be residual from battery shop dry well operations.

Lead was detected at the 17.5-foot sample depth (vertical depth 15 feet) at 110 mg/kg and not in any other samples. This is higher than the single lead detection (24.2 mg/kg) out of the 31 samples taken from base background borings at Sites 2, 3, 6, 13, 15, and 19, and in most soil samples on base, other than those near a known or suspected lead source. Although no analyses were available for the neutralized acid from lead batteries, the neutralized acid is anticipated to have contained some dissolved lead. The source of the lead detected in the soil is interpreted to be the battery shop dry well. The DHS TTLC for lead is 1,000 mg/kg.

Sodium concentrations in samples from boring 4-C-ISB were much greater (up to 7 standard deviations) than averaged values from background borings at other sites on base. The source of the sodium may have been the buffering compound used to neutralize the battery acid. High barium concentrations (up to 6 standard deviations greater) were also noted in the boring. The potential source of barium is unknown.

Aluminum, calcium, iron, chromium, nickel, magnesium, vanadium, and line concentrations in the soil below a depth of about 30 feet were generally two to three standard deviations below average background values for those metals. The relatively low metal concentrations are generally similar to concentrations in sand samples from background borings and may be a characteristic of the coarse-grained soil below the dry well at Site 4 or due to leaching by partially neutralized acids.

Groundwater

Groundwater was sampled and analyzed twice from the one well at Site 4. Water quality parameters for the sample were of similar magnitude to groundwater samples from other sites near the flight line. No TFH-diesel, TFH-gas, or lead were

detected. The groundwater does not appear to be contaminated at the location of the monitoring well on Site 4.

4.1.4.3.1 Zones of Contamination

Soil

Contamination detected in the soil was limited to above-background concentrations of sodium, barium, beryllium, cadmium, manganese, and lead. Lower than average concentrations of metals, including chromium, calcium, and iron, were detected below depths of about 30 feet. A pH value of 3.6 was detected in the sample from 30 feet.

Metals detected above background were more than two standard deviations above averaged levels in background soil boring samples from other IRP sites on base. Therefore these metals may not be naturally occurring. The sodium and lead can be attributed to operations and materials used at the neutralized battery acid dry well. The source of barium, beryllium, and manganese is not known.

Likewise, the relatively low concentrations of metals discussed above were detected below the two standard deviation interval of the averaged background levels. This is interpreted as indicative of secondary contamination effects because low metal concentrations were probably caused by the acidic environment. The 3.6 pH soil sampled from a depth of 24 feet represents acidic contamination. In a low pH environment there are an abundance of hydrogen cations that will preferentially bond to any available anions. This chemical action will displace metal cations that may have been naturally occurring in the soil, forcing them into solution in the buffered acid as it moves through the vadose zone. The metal cations, especially multivalent cations such as chromium, calcium, and iron, will remain in solution.

Based on the one angled soil boring drilled at Site 4, the depth of soil affected by the neutralized acid dry well cannot be determined. However, within the soil sampled, no metal concentrations were detected above TTLCs.

Groundwater

No contaminants were detected in groundwater at Site 4, based on Stage 2-1 sampling from 4-C-1.

4.1.4.3.2 Contaminant Migration

Migration of contamination detected in the soil at Site 4 has occurred as discussed above. However, groundwater has

not been impacted, based on sampling to date from the Site 4 monitoring well. Migration by surface water is not likely at Site 4.

4.1.4.3.2.1 Potential to Move Off Site and Off Base

Based on detected conditions at Site 4, the potential for contamination to move off the site or off base is very low. If metals migrate through the soil to groundwater below Site 4, the potential to move off the site or off the base would increase.

4.1.4.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Presently, contaminant migration is not expected from Site 4. Groundwater flows generally to the west at Site 4. If contaminants from Site 4 reach the groundwater, migration would be towards the west.

4.1.4.3.2.3 Time of Travel to Receptors

Based on present conditions, contaminant migration is not expected from Site 4.

4.1.4.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 4 because of the lack of well-defined values required for input to a model and the lack of detected contamination in the ground-water.

4.1.4.3.2.5 Expected Spatial and Temporal Variations in Concentration

Spatial or temporal variations in groundwater chemistry were not detected in the two semiannual sampling rounds at Site 4.

4.1.4.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.5 DISCUSSION OF RESULTS FOR SITE 5: SR-71 SHELTERS DRAINAGE AREA

From 1966 to 1990, ground operation of SR-71 aircraft resulted in about 300 gallons per week (about 375,000 gallons over the 24-year period) of JP-7 jet fuel being leaked onto the hangar floors and shelter apron area. Some fuel ran off the taxiway into an oil-water separator. Runoff also flowed onto soil and gravel between the SR-71 shelter apron and flightline taxiways and enters a nearby storm sewer. This storm sewer flows into the West Drainage Ditch (Site 1).

In the Phase II, Stage 1 study, six soil borings and one monitoring well were sampled and analyzed. Oil and grease were detected in three of the borings at 16.5-foot depths (total boring depth) at concentrations ranging from 400 to 4,000 mg/kg. No contamination was detected in the groundwater in the initial IRP study.

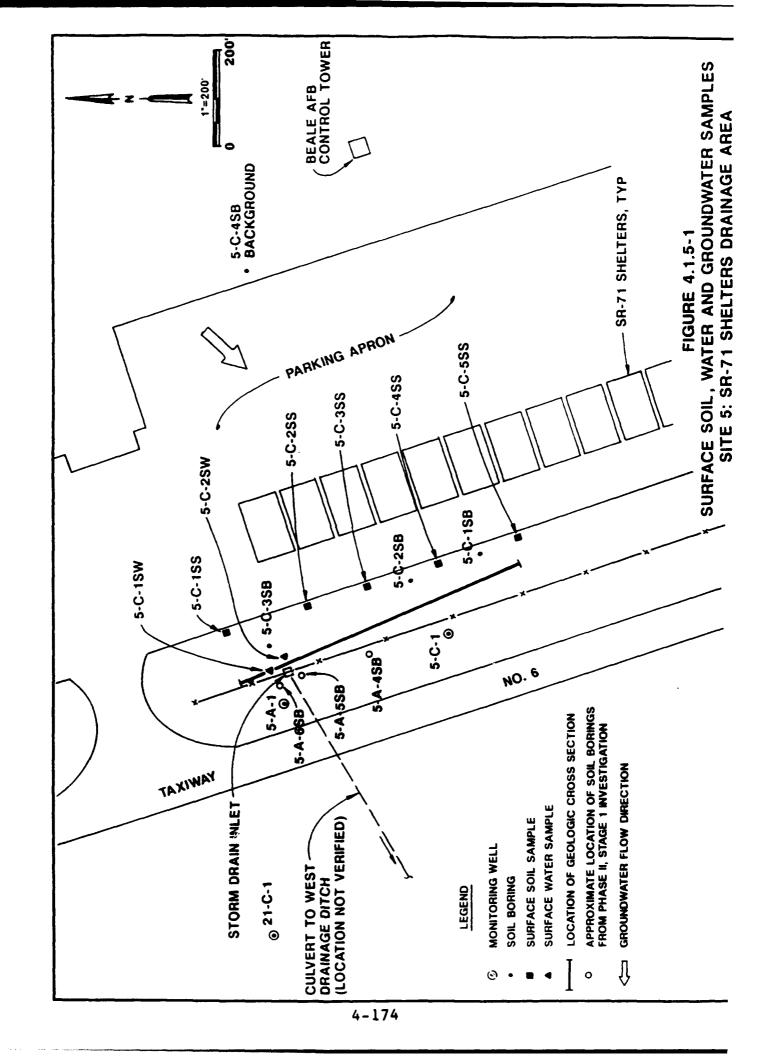
In the Stage 2-1 study, two rounds of surface water samples, four surface soil samples, samples from four soil borings, and two rounds of groundwater samples from one new and one existing monitoring well were collected and analyzed. Generally TFH contamination was detected in the near surface soil and surface water. TCE was detected in one sample from one of the two monitoring wells.

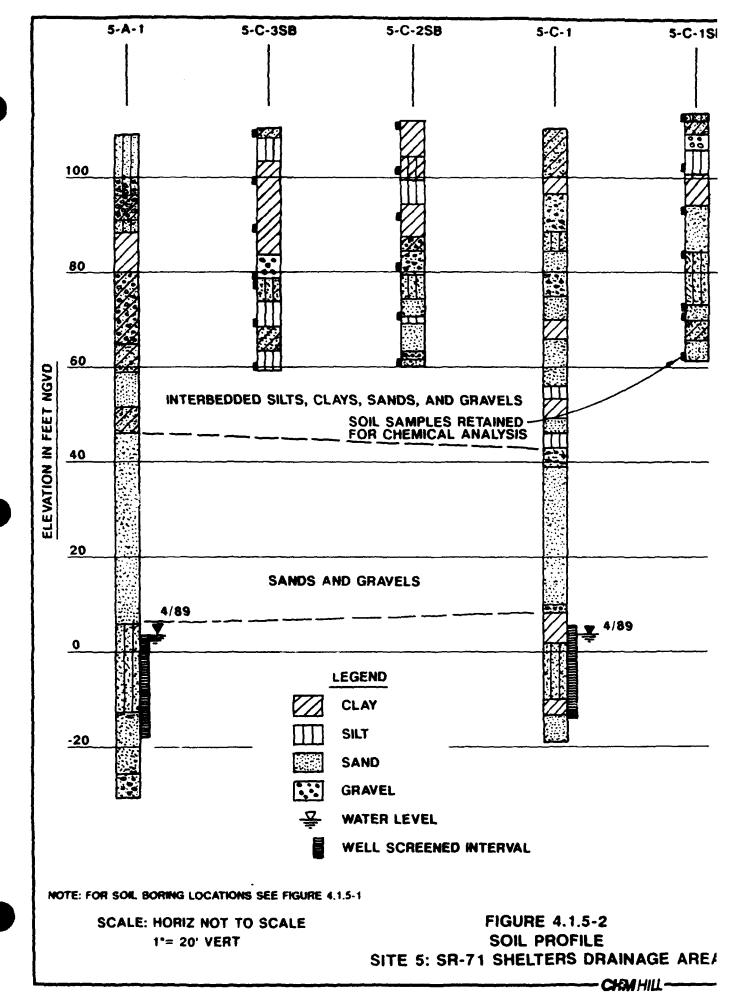
4.1.5.1 Presentation of Results

4.1.5.1.1. Site Geology

Evaluation of local geology at Site 5 is based on drilling activities completed during the current Stage 2-1 Remedial Investigation and on the well drilled during the Phase II, Stage 1 investigation. During the current investigation, four boreholes were drilled to a depth of 50 feet. In addition, a well was installed across the water table to a total depth of 128 feet (-18 feet NGVD). During the Phase II, Stage 1 investigation, a well was constructed across the water table and the borehole advanced to a depth of 140 feet (-32 feet NGVD). The location of these wells and boreholes is shown on Figure 4.1.5-1. Soil boring logs are provided in Appendix D.

A geologic cross-section was prepared by projecting soil boring logs of wells 5-A-1 and 5-C-1 and soil borings 5-C-1SB, 5-C-2SB, and 5-C-3SB. The location of this cross-section is shown on Figure 4.1.5-1. The cross-section is presented on Figure 4.1.5-2. As shown on Figure 4.1.5-2, subsurface materials at Site 5 are comprised of an alluvial





sequence of clays, silts, sands, and gravels. Although it is difficult to make correlations among the boreholes in the near-surface materials, a correlation may be made between coarse-grained materials encountered in wells 5-A-1 and 5-C-1 below an elevation of about 65 feet in depth (45 feet NGVD). From this point to the bottom of the boreholes, the wells are completed in a thick sequence of sands and gravels, with an interval of silty sand lying from about 105 to 122 feet in depth (+5 to -12 feet NGVD). In well 5-C-1, the silty sand is overlain by a well-indurated clay lens, which may partly confine the groundwater in a limited area around well 5-C-1. The thick, coarse-grained sequence observed in the two wells may be correlated with a similar sequence located about 70 to 140 feet in depth (20 feet to -50 feet NGVD) in wells at Site 1. The greater depth to these materials at Site I may reflect a westerly dip in the materials.

Surface soils at Site 5 have been mapped as Redding-Corning Gravelly Loams, which is derived from mixed sources and formed on old alluvial fans or terraces (Herbert and Begg, 1969; SCS, 1985). These fans and terraces are part of the dissected alluvial uplands which have been assigned to the Laguna Formation. The Laguna Formation consists of continental deposits of Pleistocene-Pliocene Epoch which range from fine-grained, compacted materials to coarse poorly-sorted gravels. Sediments of the Laguna Formation are nonvolcanic in origin, which distinguishes them from the volcanics of the Sierra Nevada over which they lie. The Laguna Formation typically contains consolidated layers that locally restrict the vertical flow of water, and dip gently to the southwest (Page, 1980).

Soil boring logs from Site 5 (Appendix D) contain many references to indurated materials at various depths in the boreholes. Based on color references, no volcanic materials were contacted. Subsurface materials consisted of a heterogeneous mixture of alluvial sediments. Thus, the boreholes at Site 5 were probably drilled entirely in the Laguna Formation.

4.1.5.1.2 Site Hydrogeology

Near-surface groundwater at Site 5 appears to flow under mainly unconfined conditions. In well 5-C-1, cuttings were moist in silty sand immediately beneath a well-indurated clay unit at about 108 feet in depth (2 feet NGVD). The borehole did not actually produce water during drilling until a well-graded sand was encountered at 123 feet in depth (an elevation of -13 feet NGVD) below a thin clay layer. Following construction of the well, the water level stabilized at about 3 feet NGVD. The clay unit was not ob-

served during the drilling of well 5-A-1. Groundwater in this well appeared to be unconfined (AeroVironment, 1987). Both wells are completed in permeable sands and gravels to their total depth.

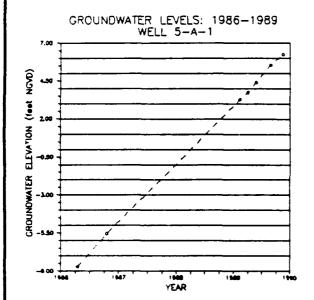
Table 4.1.5-1 and Figure 4.1.5-3 present groundwater level data collected during the Phase II and Stage 2-1 investigations. The data show that the water level rose nearly 14 feet in well 5-A-1 between April 1986 and November 1989. This rise is similar to the 17-foot rise observed during the same period nearby at Site 1, and apparently corresponds to a regional rise in the water table. Water levels in both Site 5 wells rose throughout 1989.

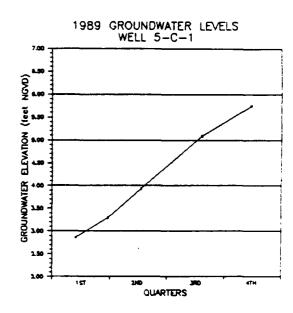
Table 4.1.5-1 GROUNDWATER ELEVATIONS: SITE 5 (FEET NGVD)

_Well	Screened Interval							
5-A-1	-8 to -28	-7.71	-5.54	3.26	3.74	4.38	5.54	6.22
5-C-1	6 to -14			2.86	3.30	3.94	5.09	5.75

Figure 4.1.5-4 presents groundwater contours plotted from groundwater elevations in wells in the north area of Beale AFB that are screened across the uppermost permeable zone. The figure shows that groundwater is flowing to the south-southwest at an average gradient of about 1 foot per 625 feet, or 0.0016. This flow direction is apparently influenced by a groundwater depression located to the west of Beale AFB. The regional impact of the depression is seen on Plates 3 and 4. This depression apparently causes flow lines to bend to the south in the vicinity of Site 5, which effectively lowers the hydraulic gradient. The low gradient may also reflect the presence of relativley more coarsegrained materials in the north part of the base, although the data are insufficient to confirm this.

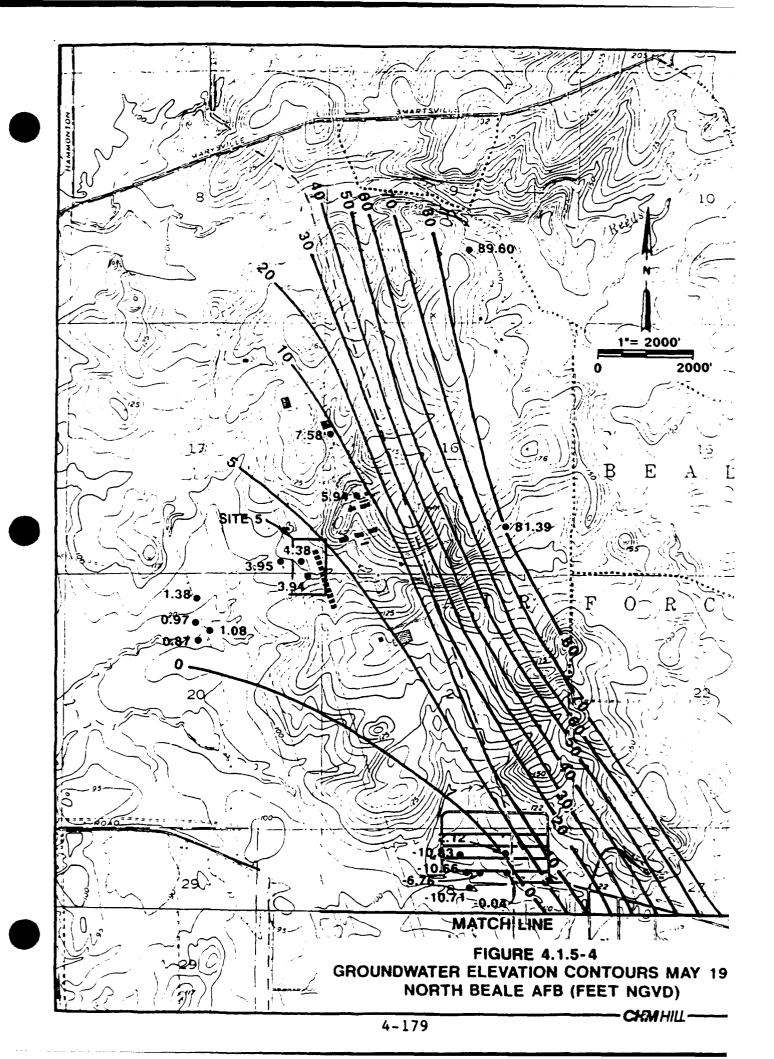
This plate also shows a steepening of the groundwater gradient immediately to the east of Site 5. This gradient change may reflect a change in groundwater flow from consolidated to unconsolidated geologic materials at the edge of the Central Valley. A 4-hour pump test at a rate of 8.5 gpm was performed on well 5-C-1, followed by 4 hours of monitored recovery. Water levels were also monitored in nearby wells 5-A-1 and 21-C-1 during the test, but there was no response in these wells to the pumping in well 5-C-1. The lack of response may be attributed to the low pumping





NOTE: VARYING TIME SCALES

FIGURE 4.1.5-3
MONITORING WELL HYDROGRAPI
SITE 5: SR71 HANGAR RUNOFF ARI



rate, the short duration of pumping, unconfined aquifer conditions, and distance to these wells (350 feet to well 5-A-1, and 700 feet to well 21-C-1). Drawdown and recovery data were analyzed according to the Cooper-Jacob semilog method. Plots of the aquifer tests and a discussion of the method of analysis is included in Appendix E. The average value of transmissivity obtained from the test was about 5,600 gallons per day per foot, or 750 square feet per day. The average value obtained for hydraulic conductivity was about 44 feet per day (1.6 x 10^2 cm/sec). These values are typical for the sand with silt and sands in which well 5-C-1 is screened (Freeze and Cherry, 1979).

The average linear velocity of groundwater flow may be estimated by substituting into Darcy's Law. Using the hydraulic conductivity derived from the 72-hour pump test in well 19-C-4 of 28 feet per day, the measured hydraulic gradient of 0.0016, and an estimated effective transport porosity of 0.20, the estimated velocity of groundwater movement beneath Site 5 is about 0.22 feet per day, or 82 feet per year.

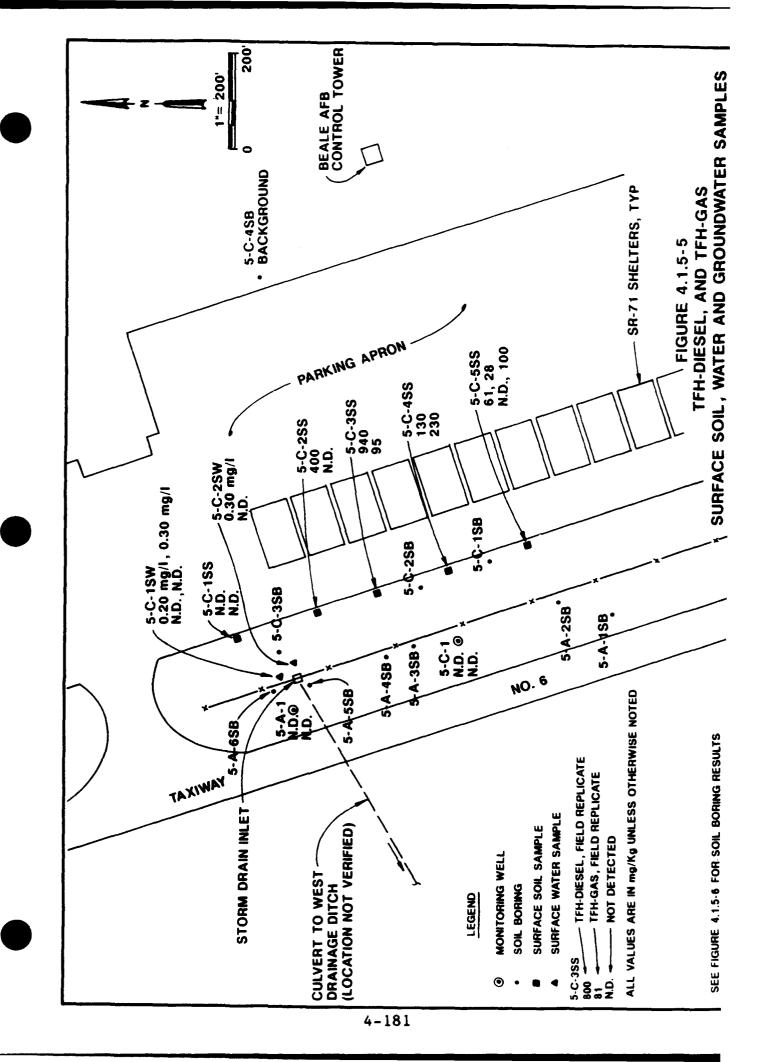
4.1.5.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.5.1.4 and in Appendix A.

Surface Water

In each of the two semiannual rounds of water sampling at Site 5, two surface water runoff samples were taken at the edge of the apron west of the SR-71 shelters during rainfall events. Groundwater samples were collected from monitoring wells 5-A-1 and 5-C-1 (Figure 4.1.5-5). Analyses performed on the surface water runoff and groundwater samples were purgeable halocarbons (8010), ICP metals (6010), water quality parameters, and TFH-diesel and -gas.

Purgeable halocarbons and TFH-gas were not detected in surface water samples in the two semiannual sampling rounds. TFH-diesel was detected at 0.20~mg/l in surface water sample 5-C-1SW and 0.30~mg/l in 5-C-2SW (March 1989), and 0.16~and 2.2~mg/l (September 1989). In these samples, TDS was 102~and 72~mg/l (March 1989) and 27~and 10~mg/l (September



1989), nitrate 1.3 and 0.82 mg/l (March 1989) and 0.31 and 0.35 mg/l (September 1989), and zinc 0.889 and 0.208 mg/l (March 1989) and 0.028 and 0.070 mg/l (September 1989). Chloride and fluoride were not detected in either round. Other common ions typical of surface runoff were detected at low levels.

Soil

During the IRP Phase II, Stage 1 investigation (AeroVironment, 1987) six soil borings were drilled west of the fence between the shelters and Taxiway No. 6. No contamination was detected in borings south of the three northernmost SR-71 shelters (Figure 4.1.5-5). Boring 5-A-6SB had oil and grease detected at 400 mg/kg in the surface sample, 4,000 mg/kg in the 6-foot sample and 1,100 mg/kg in the 16-foot sample. Boring 5-A-5SB had 400 mg/kg oil and grease in all three soil samples. Boring 5-A-4SB had oil and grease detected at 500 mg/kg in the surface sample and 400 mg/kg at 16 feet.

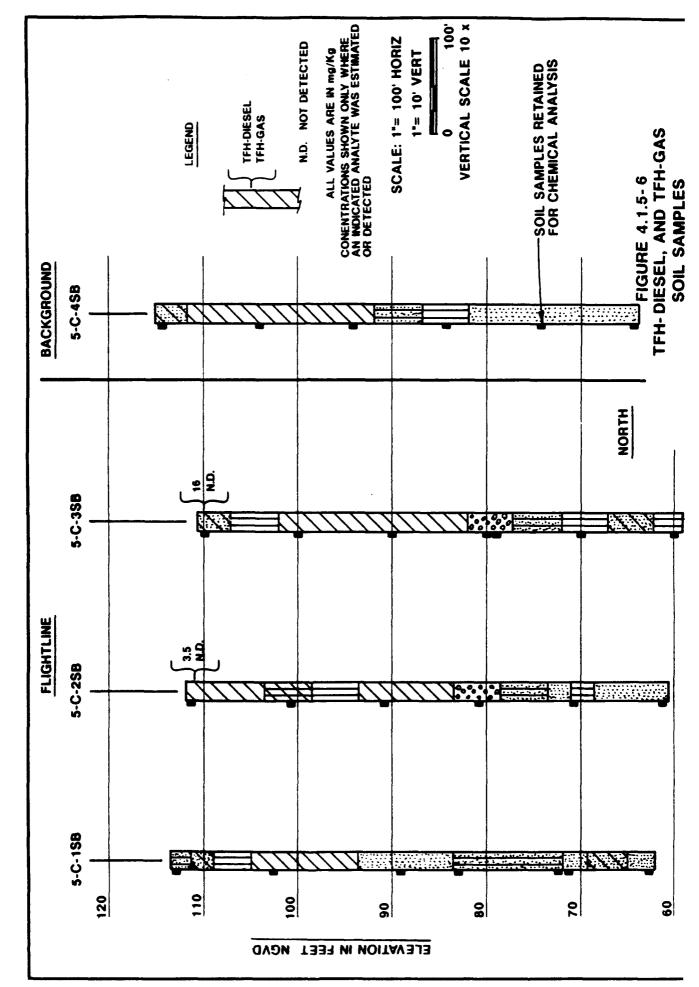
During Stage 2-1 activities, five surface soil samples were collected at Site 5 (Figure 4.1.5-5). Twenty-four soil samples were taken from three 50-foot vertical borings (5-C-1SB, 5-C-2SB, 5-C-3SB). These borings were located east of the fence in the gravel area west of the SR-71 shelters. A background boring (5-C-4SB) was drilled in the grassy area east of the parking apron and the shelters. These surface soil and soil boring samples were analyzed for soil moisture (ASTM D2216) and TFH-diesel and -gas (California method). No organic or metals analyses were performed on soil samples at this site.

In this investigation TFH-diesel was detected in the four southern surface soil samples at concentrations of 28 (duplicate of 5-C-5SS) to 940 mg/kg (5-C-3SS, Figure 4.1.5-5). TFH-gas was detected in the three southern samples at concentrations from 95 to 230 mg/kg.

In samples from the soil borings TFH-diesel was only detected in the surface samples (0-1.5 ft) in boring 5-C-2SB at 3.5 mg/kg and in boring 5-C-3SB at 16 mg/kg (Figure 4.1.5-6). TFH-gas was not detected in any soil boring samples.

Groundwater

During sampling rounds of the IRP Phase II, Stage 1 investigation in 1986 (AeroVironment, 1987), TCE was detected in well 5-A-1 at 0.2 ug/1 in April and 0.1 ug/1 in October. Barium was detected at 0.060 mg/1 in the first round and 0.250 mg/1 in the second round.



Purgeable halocarbons, TFH-gas, and TFH-diesel were not detected in groundwater at Site 5 during the first semiannual sampling round of this investigation (March, 1989). In the ICP metals (6010) analysis calcium, magnesium, potassium, sodium, and zinc were detected. TDS ranged from 174 to 182 mg/l. Major anions and cation concentrations at these wells are similar to other sites near the flightline at Beale AFB. Fluoride was 0.30 mg/l in both wells. Nitrite plus nitrate (expressed as nitrate) was 9.8 to 10.2 mg/l. Sulfate is lower than at most sites at Beale at 4.9 to 5.1 mg/l.

In samples collected during the final semiannual round of Stage 2-1, TCE was detected in the 5-C-1 sample at 66 ug/l (60 ug/l in second column). In the sample from 5-A-1, manganese was detected at 0.109 mg/l and zinc at 0.070 mg/l. TFHs were not detected in groundwater samples. TDS were 254 and 191 mg/l in 5-A-1 and 5-C-1; chloride was 9.5 and 12.8 mg/l, fluoride at 0.20 and 0.18 mg/l, sulfate at 6.0 and 8.0 mg/l, and nitrate plus nitrite (expressed as nitrate) at 11.4 and 12.7 mg/l. Groundwater at Site 5 is a sodium-calcium bicarbonate type.

4.1.5.1.4 Analytical Results Table

Table 4.1.5-2 presents a summary of all detected analytes for Site 5. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.5-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of Applicable or Relevant and Appropriate Requirements (ARARs) is given in Appendix I.

4.1.5.1.5 Discussion of Analytical Data

The only contaminants detected at Site 5 were fuel hydrocarbons and TCE. Surface water runoff contained diesel components and both diesel and gas components were detected in surface soils. Diesel components were also detected in two of the four soil borings, but only in the first sample collected from each boring (zero to 1.5 feet). TCE was detected at 66 ug/l in the second semiannual sampling round at well 5-C-l. Table 4.1.5-3 presents the range of contaminants encountered for each of the media sampled (surface runoff, surface soil, soil borings), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

TABLE 4.1.5-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 5

Par ame ter	Re thod	Detection Limit	Units	Standards, Criteria and Action Levels (a) Federal State	5-C-1SS BAFB-0029 0.0-1.01 11/18/88	5-C-2SS BAFB-0030 0.0-1.0	5-C-3SS BAFB-0031 0.0-1.0*	5-C-4SS BAFB-0032 0.0-1.0*	5-C-5SS BAFB-0033 0.0-1.0'	5-C-5SS ^f BAFB-0034 0.0-1.0 ¹
Percent Moisture JFH-Diesel JFH-Gas	ASA#9 TFN-DI TFN-GA	1.0 50	#6/kg #6/kg	SE SE SE	8.2 2.2 5.2	12.7 400 ND	14.7 940 95	18 130 230	76.9 61 8	12 28 100
Perameter	Method	Detection Limit	units	Standards, Criteria and Action Levels (a) Federal State	5-C-1SB BAFB-0380 0.0-3.0' 01/09/89	5-C-158 BAFB-0361 10.0-11.5	5-C-1SB BAFB-0362 23.0-24.51 01/09/89	5-C-158 BAF8-0363 30.0-31.5	5-C-1SB BAFB-0384 40.0-41.5' 01/09/89	5-C-158 BAFB-0365 41.5-43.0* 01/09/89
Percent Moisture	ASA#9	N/A	pt	SZ	18.4	21.1	22.4	15.5	19.4	11
Persec	Rethod	Detection Limit	S Tts	Standards, Criteria and Action Levela (a) Federal State	5-C-158 BAFB-0366 50.0-51.5 01/09/89	5-C-288 BAFB-0387 0.0-1.51 01/10/89	5-C-258 BAFB-0388 10.0-11.5	5-C-25B BAFB-0389 20.0-21.51 01/10/89	5-C-2SB BAFB-0390 30.0-31.5* 01/10/89	5-C-2SB BAFB-0391 40.0-41.5
Percent Moisture TFM-Diesel	ASA#9 TFH-DI	1.0	X mg/kg	SS SS	13.3 MD	13.1 3.5	12.8 FO	74.5 BB	20.2 MD	2 9

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MD: analyte not detected.

MD: field blank (ambient condition blank)

MD: field blank (ambient condition blank)

MD: field replicate

MD: field replicate

MD: field blank (ambient condition blank)

MD: field replicate

MD: field replication limits

MD: field blank (ambient condition blank)

MD: field blank (ambient condition blank)

MD: field replication blank)

MD: field replication blank)

MD: field blank (ambient condition blank)

MD: field blank (ambient condition blank)

MD: field blank (ambient condition blank)

MD: field replication limit field replication limit field replication limits for each analysis are given in Appendix A.

TABLE 4.1.5-2 (continued)

oisture ASA#9 N/A X NS NS 9.5 17.3 TFM-DI 1.0 mg/kg NS NS 9.5 17.3	Det Parameter Method L	Method	Detection Limit	Units	Standards, Criteria and Action Levels (a)	₹ % □	-	5-C-3SB BAFB-0393 0.0-1.5' 01/11/89	5-C-3SB BAFB-0394 10.0-11.5' 01/11/89	5-C-3SB BAFB-0395 20.0-21.5' 01/11/89	5-C-3SB BAFB-0396 30.0-31.5	5-C-3SB ^f BAFB-0397 31.5-33.0 ^f 01/11/69
Standards, Criteria 5-C-3SB 5-C-3SB and Action Levels (a) BAFB-0399 BAFB-0399 BAFB-0399 BAFB-0399 BAFB-0399 BAFB-041.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 40.0-41.5' 50.0-51.5' Method Limit Units Faderal State 01/12/89 01/12/89 oisture ASA#9 M/A X MS NS 12 16.4	Percent Moisture TFM-Diesel	ASA#9 TFH-DI	N/A 1.0	mg/kg	S S	S S S	8.5 8	17.3	15.2 M	21.1 **D	13.1 ND	22.1 MD
Noisture ASA#9 N/A X NS NS 17.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.8 18.6 18.8 18.6 18.6 18.8 18.6 18.	Parameter	Wethod	Detection Limit	•	Standards, Criter and Action Levels Federal St	;		5-C-3SB AFB-0399 0.0-41.5'		5-C-4SB BAFB-0401 10.0-11.5'	5-C-4SB BAFB-0402 20.0-21.5' 01/12/89	5-C-458 BAFB-0403 30.0-31.5*
Standards, Criteria 5-C-4SB and Action Levels (s) BAFB-0404 Detection	; ;		N/A	**	SZ		17.8	82 83	12.8	20.8	22	16.5
ASA#9 N/A X NS NS 12	'ar game ter	re thod	Detection Limit	Units	Standards, Criteriand Action Levels	i i	458 0404 B 41.5' 5	5-C-4S8 AFB-0405 0.0-51.5*				
	ercent Moisture	ASA#9		×	SZ	SN.	12	16.4	, , , , , , , , , , , , , , , , , , ,	• • • • • • • • • • • • • • • • • • •		

8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

(): yalues listed in () are 2nd column confirmation values.

e: equipment wash blank f: field replicate R: resample

a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.5-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 5

				Standards, Criteria and Action Levels (Standards, Criteria and Action Levels (a)	S-c-16W	5-A-1GU	5-C-15W	5-C-15W	5-c-18K	5-C-15V ^{bn}
Parameter	Hethod	Detection Limit	Units	Federal	State	6AFB-0488 03/10/89	BAFB-0469 03/13/89	03/02/89	03/02/89	03/02/89	
	£120 4	-		SA	006	165	161	501	5	H	=
Specific Londoctivity		- 1		S 4	SE	21.3	21.0	13.0	13.0	H	Ħ
	110.1	< *	, ₇	, c	SX	7.29	7.43	7.39	7.55	H	H
FC	207	, -	į	20	SE	56.4	2.8	Ħ	H	Ħ	=
Picetonicy - 10ter	107	-		<i>S</i>	SE	8.89	88.8	Ħ	K.K	H	-
Total Disease Colide	E160 1		Ì	200	200	182	174	102	Ħ	H	Ħ
	X	0		250	250	10.9	6.6	€	H	H	H
	5.645		Ì	~	1.4	0.30	0.30	9	H	H	Ħ
FLOOTIGE STATES A NICES	1 1513	9	Ì	10.	53	10.2	9.8	1.3	Ħ	H	
BILLEGE + BILLICE	. KF		Ì	250	250	6.4	5.1	11.2	H	H	H
	TEH-DI	. C	Ì	S	SE	2	2	0.20	0.30	0.10	Ξ
	CLOALO.	5	Ì	2	SZ	10.7	10.1	23.1	T.		Ħ
יייייייייייייייייייייייייייייייייייייי	214010	8.5	Ì		SZ	8.8	5.39	2	-	13	E
Magness Lan	200	3.5	Ì	Z	SZ	09.1	1.50	9	×	Ħ	H
Potession		8		S	SZ	18.6	15.1	5.68	IX	X	Ħ
Zinc	Su6 010	0.0200	7	0.110	0.012	0.0840	0.0220	0.889	=	1	LN .
NOTES: Results reported for detected ana	or detected	enelytes only.	only.	,		1	4			Are Id does - transfer of	Ť.
MT: analyte not tested					estimated vi	mnalyte detected in blank estimated value, below quantification limit	™ ⊋uentificet	ion limit	†: †:	field replicate	i i
MS: No standard criteria c	or action L		currently exists	<u>ظ</u>	field blank (a	(ambient cor	mbient condition blank)	¥.	R: res	resample	
(): values listed in () are 2nd column	are 2nd col		confirmation values	es. n:	no analytes	no analytes detected for analyses performed	r analyses	performed			

(): values listed in () are 2nd column confirmation values. n: no analytes detected for analyses performed as Values represent most stringent standard, criteria or action level. See Appendix I. ** The federal standard for Mitrate + Mitrite is riven as 10 mg/l as Mitragen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate. Detection limits for each analysis are given in Appendix A. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.5-2 (continued)

				Standards, Criteria and Action Levels (a)	riteria evels (a)	5-c-2sw	
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0472 03/02/89	
Specific Conductivity	E120.1	1.0	Carbos/ca	SZ	006	62	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Temperature	E170.1	K/M	O Geo	SE	S¥	11.5	
₹	E150.1	N/A	7	2-9	SE	7.65	
Total Dissolved Solids	E160.1	3.0	1/0#	200	200	0.22	
Mitrate + Witrite	E353.3	0.020)/ DE	10	45	0.82	
Sul fate	E375.4	1.0	1/04	250	250	7-7	
TFH-Diesel	TFH-DI	0.050	MQ/I	SE	S	0.30	
Catcium	Su6010	1.0	1/01	SE	S#	17.0	
Sodium	Su6010	9.	1/04	SE	KS.	2.58	
Zinc		0.0200	7	0.110	0.012	0.208	
NOTES: Results reported for detected analytes only.	or detected ar	enelytes o	nly.	1			

NT: analyte not tested

ND: analyte not detected.

ND: walues listed in () are 2nd column confirmation values.

ND: values represent most stringent standard, criteria or action level. See Appendix I.

ND: Appendix I.

ND: values represent most stringent standard, criteria or action level. See Appendix I.

ND: values represent most stringent standard for Nitrate + Nitrite is given as 10 mg/l as Nitrate + Nitrite given as Nitrate.

ND: Appendix A.

ND: Appendix

BEALE AFB: WATER DATA 3RD ROUMD SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 5

				Standards, Cand Action L	Criteria Levels (a)				45-C-28H	
Parameter	Method	Detection Limit	units	Federal	State	8AFB-0626 09/06/89	8AFB-002/ 09/06/89	6478-0030 09/18/89	69/18/89	
	6120 1	-	ampos/ca	SI	000	180	162	72	27	
specific conductivity	122	2 7	0 040	2	S	22.0	22.0	15.5	15.0	
	F150.1	* /*	7 7	2-6	SE	7.36	7.54	8.28	8.47	
Alteliaits - Total	504603	1.0	/0	50	SE	62.2	59.4	24.0	20.0	
District Const	201703	0	7	<u> </u>	NS	3.9	72.5	29.3	54.4	
Total Dissolved Colide	F160, 1	N	7	200	200	191	757	27.0	10.0	
Chick Dissolved contact	E325.3	1.0	Š	220	250	12.8	9.5	2	9	
	F740.2	0.050	/	~	1.4	0.18	0.020	2	2	
	F 151 1	080	7	10*	45	12.7	11.4	0.31	0.35	
A. L. B.C. W. L. L.C.	XX.	1	·	220	250	8.0	6.0	1.4	1.4	
JEC. 7 2000	TEN-DI	0.050	7	S	SE	2	9	0.16	2.2	
	Steep 10	9	7	S.	SE	10.9	10.7	6.10	5.10	
	Succo10	1.00	Š	S	SH	6.11	4.65	윺	욯	
	SLKO10	0.0150	,	. S.	50.	2	0.109	2	Q	
	SUKO10	90	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	S	SE	2.05	5. 8	2	욮	
	010978	00	Ì	S	SZ	18.3	15.7	1.31	윷	
2 inc	546010	0.0200	7	0.110	0.012	2	0.020	0.0280	0.0200	
Trichloroethene	Su 8 010	-	3	'n	'n	(09)99	2	2	2	
								: : : : :	· · · · · · · · · · · · · · · · · · ·	

8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. MT: analyte not tested

e: equipment wash blank f: field replicate R: resemple

Detection limits are for dilution # 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Table 4.1.5-3
RANGES OF CONTAMINANTS DETECTED AT SITE 5

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
TFH-diesel	mg/kg	ND	940	4/5
TFH-gas	mg/kg	ND	230	2/5
SOIL BORINGS				
TFH-diesel	mg/kg	NO	16.0	2/24
SURFACE WATER				
TFH-diesel	mg/l	0.20	2.2	4/4
GROUNDWATER				
trichloroethene	ug/l	ND	66	1/4

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar leve's (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the beckground averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

No data corrections have been made based on method blank detections. Analytical data are believed to accurately represent site conditions at the time of sampling.

- 4.1.5.2 Sampling and Analytical Problems
- 4.1.5.2.1 Loss of Samples

There were no sample loss problems for Site 5 samples. The only omitted analyses were the alkalinity/carbonate/bicarbonate field analyses for the two surface runoff samples in the first semiannual sampling round. The omission of these analyses is not considered critical to the final evaluation of site conditions. The omitted analyses are generally used to evaluate natural water bodies and are not meaningful for the stormwater runoff samples.

4.1.5.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

None of the analytes detected are suspected of being false positive results.

Three soil replicate QC samples were collected at Site 5. The surface soil 5-C-5SS did not have results comparable to the replicate sample. The analyte RPD for TFH-diesel was 74 percent and TFH-gas was detected in the replicate, but not in the original sample. The other two replicate QC samples were collected in soil borings and did not detect contaminants.

One replicate water sample was taken at the first surface runoff sampling point (5-C-1SW), as were one equipment wash blank and one ambient condition (field) blank. Replicate results were very comparable, but TFH-diesel was detected in the equipment wash blank at 0.10 mg/l.

4.1.5.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 5 samples.

4.1.5.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.5.3 Significance of Findings

Surface Water

Surface water was sampled semiannually during rainfall from two locations in the drainage swale which carries surface runoff from Site 5. This swale carries storm runoff and wash water from the apron to a culvert, which discharges at the West Drainage Ditch (Site 1). Water quality parameters measured in Site 5 surface water samples were at approximately the same levels as surface water samples from other streams on base. None of the standard water quality parameters for those samples indicate contamination of the surface water at Site 5. TFH-diesel was detected in all samples at 0.20 and 0.30 mg/l (0.30 mg/l in field replicate) in the first round and 0.16 and 2.2 mg/l in the second round. TFH-diesel was also detected in an equipment wash blank during the first round at 0.10 mg/l, but the second round detections confirm the presence of TFH-diesel in surface water at Site 5.

Soil

Sediment samples were collected at five locations in the drainage swale upstream of the storm drain inlet. A field replicate was collected at one location. Five of the six samples (including the field replicate) had detected TFH-diesel at concentrations ranging from 28 to 940 mg/kg. Three of the six had TFH-gas at concentrations ranging from 95 to 230 mg/kg. TFH-gas was detected in the field duplicate at 100 mg/kg but not in the corresponding sample. These detected TFHs could impact the environment through release of hydrocarbons to the ephemeral surface water.

Four soil borings were drilled at Site 5, three west of the SR-71 shelters and one background boring east of the shelters. Two of the borings west of the shelters had detected TFH-diesel in the surface samples at 3.5 and 16 mg/kg. TFH-diesel and -gas were not detected in any other soil samples on Site 5.

Groundwater

TCE was detected at 66 ug/l (60 ug/l in the second column) in the September 1989 groundwater sample of well 5-C-l at Site 5. It is not known why TCE increased from not detected in the first sampling round at a LOQ of 1 ug/l to 66 ug/l in the second round. The EPA Drinking Water Standards MCL for TCE is 5 ug/l, as is the DHS action level. The EPA MCL goal is zero. The TCE levels detected in the second semiannual sample round at well 5-C-l exceed both the EPA MCL and the DHS action level. All standard water quality parameters were at approximately the same levels in both wells and do not indicate the presence of contamination.

4.1.5.3.1 Zones of Contamination

Information collected during previous investigations and in this phase indicate that aircraft fuel that leaked from the SR-71 aircraft has impacted the environment at Site 5 and downstream in the West Drainage Ditch (Site 1). The Phase II, Stage 1 study detected oil and grease at depths below the ground surface to 16.5 feet. Information collected in the Stage 2-1 study indicates that surface water at Site 5 contained TFH-diesel. The concentrations detected in the second semiannual round of surface water sampling (September 1989) may represent the highest concentrations that occur annually. This sampling was conducted during the first seasonal rainfall, when pavement runoff may contain the highest concentrations of spilled fuel and dirt as these are washed from the pavement surface.

The current Stage 2-1 study detected TFH-diesel and -gas only in the surface soil and surface sediment samples, though soil borings were drilled to depths of 50 feet. The soil area that had the greatest concentrations of hydrocarbons is within a 20-foot radius of the storm drainage inlet, to depths of at least 16.5 feet (based on Phase II Stage 1 analyses).

Groundwater sampled from the two monitoring wells at Site 5 was not contaminated with TFH, but did contain TCE in one sample.

4.1.5.3.2 Contaminant Migration

Contaminants migrate from Site 5 in the surface water and groundwater. It is probable that a portion of the contaminants detected at Site 1 originate from Site 5. However, the partial contribution of contaminants from Site 5 to the compounds detected in surface water, surface sediments, or groundwater at Site 1 cannot be accurately quantified at this time.

4.1.5.3.2.1 Potential to Move Off Site and Off Base

The potential for the contaminants detected at Site 5 to move both off site and off base is high. The storm drain inlet flows into an unnamed ephemeral stream which crosses the base boundary less than 6,000 feet from Site 5. The stream flows into Hutchinson Creek about 3 miles from the base boundary.

The groundwater in the area is moving to the southwest, and the detected TCE contamination in the groundwater will also move in this direction. The potential for this TCE to migrate off site is high. 4.1.5.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

The estimated peak velocity of the unnamed stream is 5 feet per second, based on observations made during storm flow conditions in the West Drainage Ditch (Site 1). At this estimated velocity, stream water will cross the base boundary approximately 20 minutes after leaving Site 5. The stream flows in a southwesterly direction.

Groundwater at Site 5 moves to the southwest, toward the groundwater depression west of the base. The estimated groundwater velocity is about 80 feet per year, based on the 72-hour pump test conducted at well 19-C-4.

4.1.5.3.2.3 Time of Travel to Receptors

Base personnel working in the Site 5 area are the primary potential human receptors at this site. These potential receptors may be exposed to the TFHs while they are in the area. This site is upstream from and contributes flow to Site 1, the West Drainage Ditch. The nearest receptor downstream of Site 1, if any, is not known. During a storm, surface water from Site 5 may reach Hutchinson Creek (west of the base) within 1 hour.

If contaminants pass into groundwater, users of base and domestic supply wells to the west of the site could be potential receptors. However, based on the estimated groundwater velocity presented in Section 4.1.5.1.2, it would take many years to reach nearby supply wells. However, contaminants may have been released at Site 5 for a long time.

4.1.5.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 5 because of the lack of well-defined parameters required for accurate modeling.

4.1.5.3.2.5 Expected Spatial and Temporal Variations in Concentration

TFH-diesel and -gas were observed only in surface soil samples collected from soil at the edge of the pavement in front of the SR-71 shelters. 5-C-ISS, collected north of the shelters, did not contain TFH. In samples from soil borings, only surface samples contained TFH, none were detected at depth.

Groundwater contamination (TCE) was detected in one well in the second of two (semiannual) sampling rounds. Based on the IRP sampling conducted, the TCE concentration in groundwater is increasing at Site 5. Whether this is the result of TCE migration through soil at Site 5 or migration in groundwater from an upgradient source cannot be determined.

4.1.5.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1 activities.

4.1.6 DISCUSSION OF RESULTS FOR SITE 6: LANDFILL NO. 2

Site 6 (Landfill No. 2) occupies 56 acres in the southern sector of the base. Landfill No. 2 is located just south of 6th Street near its intersection with Earle Road. It was used primarily for refuse disposal from the early 1950s until 1980. Between 1967 and 1978, about 380 cubic yards of sludge from the photo wastewater treatment plant (Site 2) were disposed here (Engineering Science, 1984). Chemicals and petroleum were also disposed in reportedly small quantities in Landfill No. 2. It is now used to dispose of dirt, wood, and other inert construction and grounds maintenance debris. The landfill at Site 6 does not have an engineered liner system or leachate collection system.

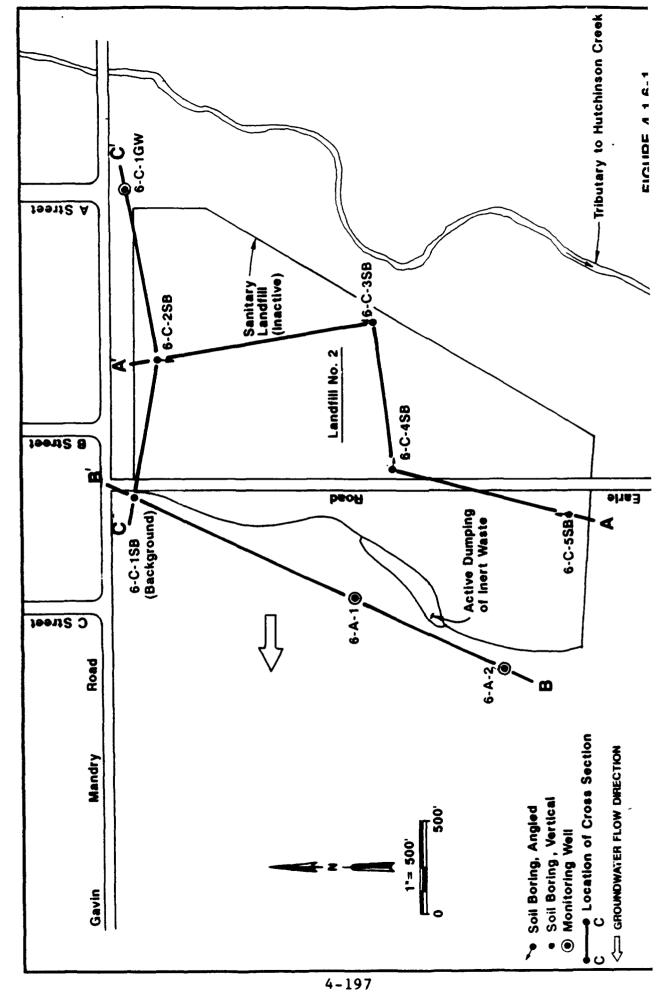
Landfill No. 2 was in use after Landfill No. 1 (Site 13), and more is known about the operations. Aerial photographs (Beale AFB, 1987) clearly show an organized series of parallel, east-west trenches. Borings around the landfill confirmed the extent of the fill. Although estimates of the depth and extent of operations appear to be correct; original estimates of the amount of wastes deposited in the landfill at Site 6 appear too low. The amount of refuse deposited at Site 6 was originally estimated to be 45,000 cubic yards. Using operational criteria currently employed at Landfill No. 3 (15-foot-deep trenches covering 70 percent of the landfill surface area) and believed to be similar to past operations at Landfill No. 2, the total amount of refuse in Landfill No. 2 may be as much as 950,000 cubic yards.

During the Stage 2-1 study, five soil borings and one monitoring well were drilled and sampled at Site 6. Two existing wells were also sampled. Four of the borings were angled borings beneath backfilled landfill trenches. The remaining boring was a vertical background boring. The new monitoring well was installed on the upgradient (east) side of the site. Locations of these sampling points are illustrated in Figure 4.1.6-1.

4.1.6.1 Presentation of Results

4.1.6.1.1 Site Geology

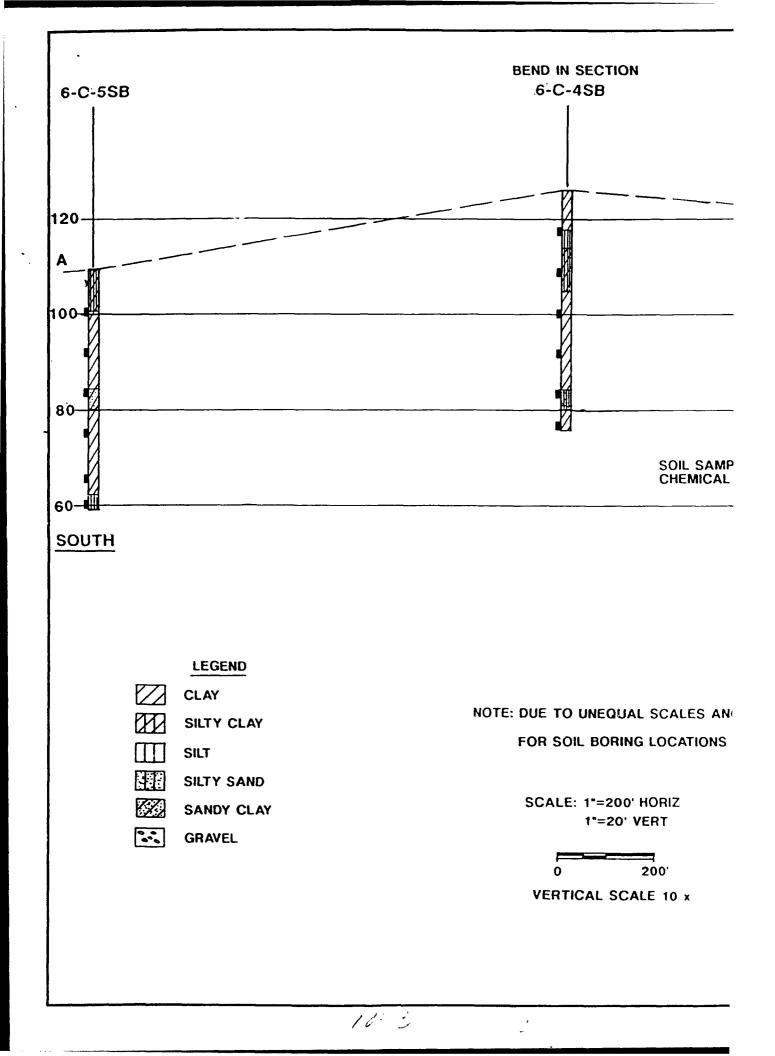
Evaluation of local geology at Site 6 is based on drilling activities completed during the Stage 2-1 study and boreholes drilled for monitoring wells during the Phase II, Stage 1 investigation. There are three monitoring wells at Site 6. Two of these were drilled during Phase II, Stage 1.

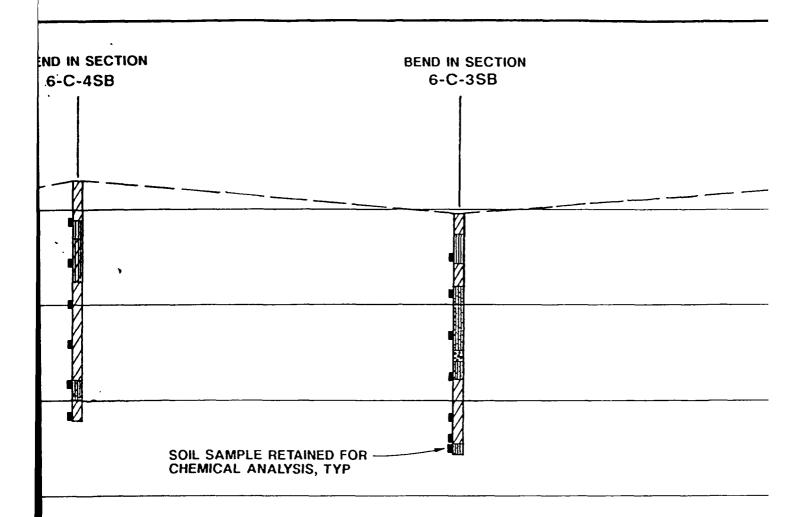


These wells are located west of the landfill (see Figure 4.1.6-1). A third well was drilled northeast of the landfill during the Stage 2-1 investigation. In addition, five boreholes were drilled and logged. Four of these were angled boreholes, drilled to total depths of about 59 feet (51 feet vertical depth). One was a vertical hole, drilled to a total depth of 51.5 feet. The location of all wells and boreholes is shown on Figure 4.1.6-1. Soil boring logs are provided in Appendix D.

Cross sections through the soil encountered in soil borings and monitoring wells in the IRP Phase II, Stage 1 and Stage 2-1 studies are located in Figure 4.1.6-1 and are shown in Figures 4.1.6-2 to 4.1.6-4. Investigations have confirmed that subsurface soils are composed of predominantly finegrained alluvial sediments deposited on westward dipping bedrock. This is typical of valley sediments deposited at the base of the Sierra Nevada foothills. Although coarser sand and gravel beds were encountered in this and previous studies, these stream channel deposits are not as common as the finer-grained flood plain deposits that predominate. As with many of the near-surface alluvial deposits in the Central Valley, individual beds in the vadose zone at Site 6 generally may not be correlated between drilling locations. Some correlation may be made between wells 6-A-1 and 6-A-2, however, in the alluvial sequence which lies just beneath the water table. Both of these wells are screened in a thick sequence of predominantly coarse-grained materials. Well 6-A-1 contacted a silty sand at a depth of about 70 feet (30 feet NGVD), which became increasingly coarsegrained to the 90-foot total depth of the well (10 feet NGVD). Well 6-A-2 contacted sand at a depth of about 50 feet (49 feet NGVD), and remained in sands and clayey sands to its total depth of 95 feet (4 feet NGVD).

Well 6-C-1 encountered sandstone at a depth of 54 feet (54 feet NGVD), and remained in this unit to the bottom of the hole at a depth of 90 feet (18 feet NGVD). The sandstone surface appears to be sloping to the west since it was not contacted in either well 6-A-1 or 6-A-2. Apparently, the slope represents an erosional surface. Because of its dark color, the sandstone may belong to the volcanic rocks from the Sierra Nevada. This unit was mapped as outcropping on the ridge that is topographically uphill (east) from well 6-C-1 (Page, 1980).





JE TO UNEQUAL SCALES ANGLED BORINGS ARE PLOTTED VERTICALLY.

OR SOIL BORING LOCATIONS SEE FIGURE 4.1.6-1

CALE: 1"=200' HORIZ 1"=20' VERT

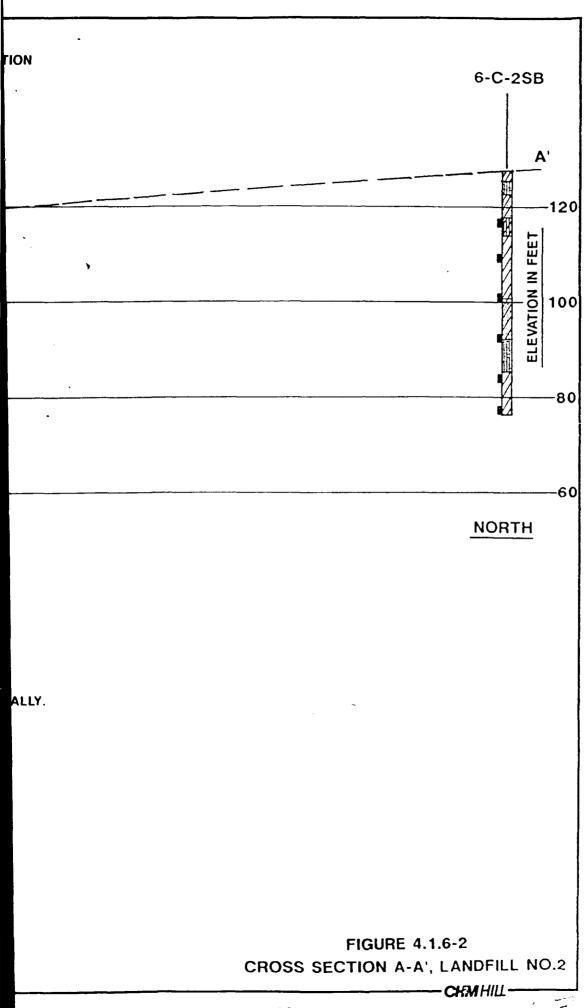
0 200'

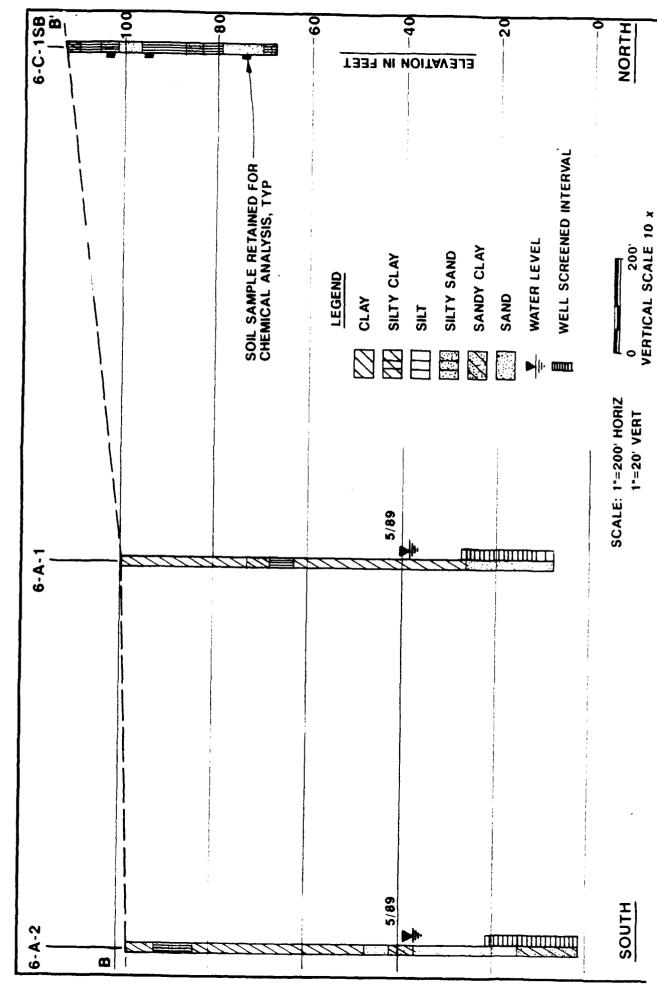
VERTICAL SCALE 10 x

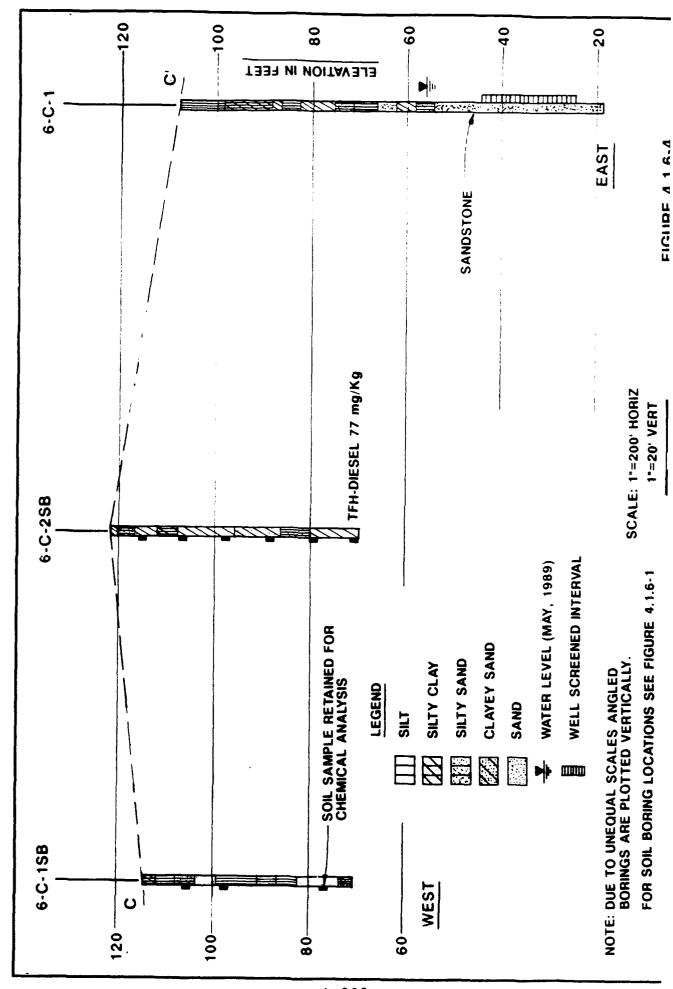
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4.1.6.1.2 Site Hydrogeology

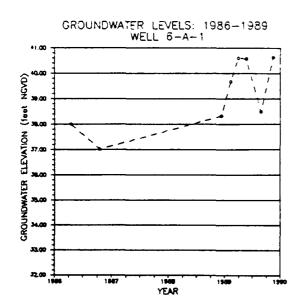
Near-surface groundwater in wells 6-A-1 and 6-A-2 appears to flow under mainly unconfined to semi-confined conditions in alluvial sediments. Well 6-A-1 is screened at a depth of 65-85 feet (14-34 feet NGVD), while 6-A-2 is screened at a depth of 73-93 feet (6-26 feet NGVD). The May 1989 water level in well 6-A-1 was at an elevation of 40.57 feet NGVD (see Table 4.1.6-1 and Figure 4.1.6-5). This level lies in a geologic unit described in the soil boring log as clay with increasing sand and silt. The water level in well 6-A-2 was 36.67 feet NGVD in May 1989, in a unit described as fine to medium sand and clay (AeroVironment, 1987).

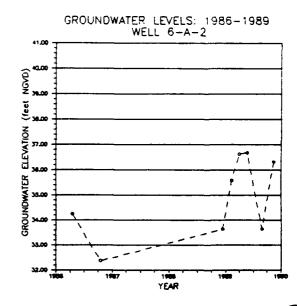
Table 4.1.6-1		
GROUNDWATER ELEVATIONS:	SITE	6
(FEET NGVD)		

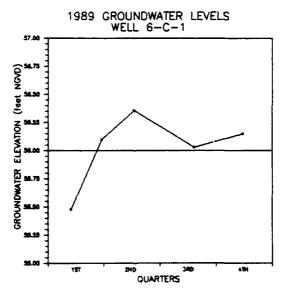
Well	Screened Interval			December	February 1989	March 1989	May 1989	August 1989	November 1989
	34 - 14 26 - 6	38.00 34.24	37.01 32.36	38.32 33.63	39.67 35.58	40.60 36.62	40.57 36.67	38.48 33.63	40.63 36.31
6-C-1	43 - 23	-	-	•	55.48	56.10	56.36	56.03	56.15

Upgradient monitoring well 6-C-1 was installed to evaluate background groundwater quality at Landfill No. 2. As described above, sandstone bedrock was encountered at a depth of 54 feet (54 feet NGVD) during drilling with sandstones continuing down to the total depth of 90 feet (18 feet NGVD). Moist samples were first encountered at a depth of 69 feet (39 feet NGVD). The only zone where groundwater was produced during drilling was from 75 to 77 feet in depth (33 to 31 feet NGVD) in friable sandstone. The well-cemented sandstone did not produce groundwater during drilling. The monitoring well was screened from 65 to 85 feet (43 to 23 feet NGVD) to capture groundwater from the producing zone. This zone may be confined at this location since the May 1989 static groundwater level measured 56.36 feet NGVD, which is more than 16 feet above the level where the first wet drill cuttings were encountered.

These wells indicate that two different hydrogeologic regimes are present at Landfill No. 2. In upgradient well 6-C-1, groundwater occurs in low permeability sandstone where groundwater moves mainly by fracture flow. The bedrock surface slopes down to the west so that groundwater in







NOTE: VARYING TIME SCALES

FIGURE 4.1.6-5
MONITORING WELL HYDROGRAPHS
SITE 6: LANDFILL NO. 2

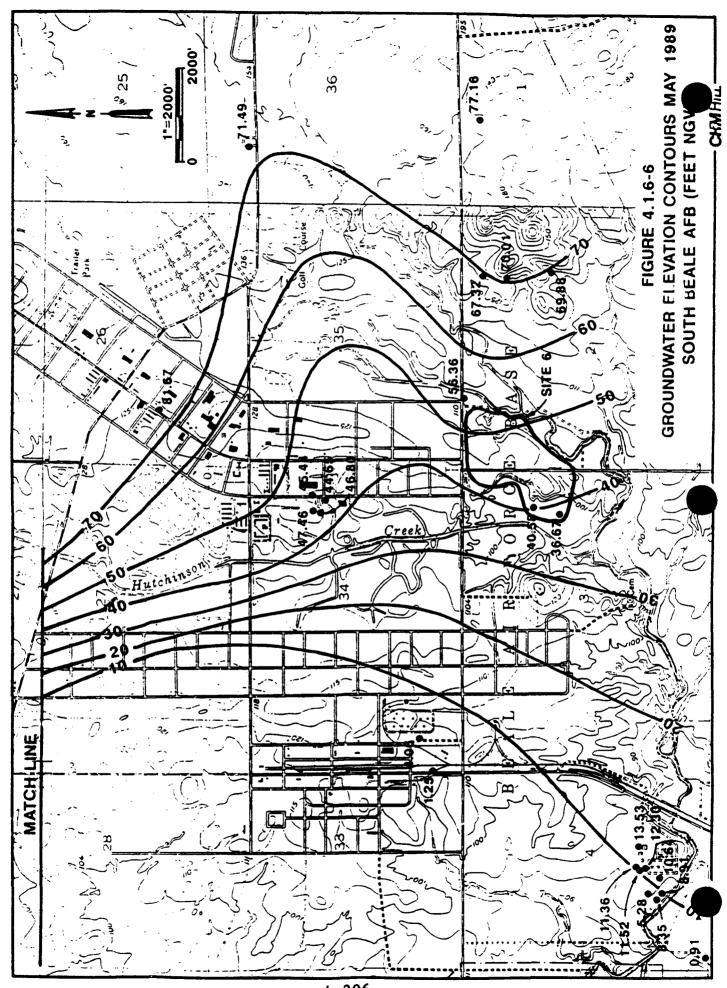
down-gradient wells on the west side of the landfill flows mainly through the higher permeability alluvial sequence that overlies the bedrock.

Table 4.1.6-1 contains groundwater level data collected between 1986 and 1989 from the monitoring wells at Site 6. Groundwater levels have risen slightly in downgradient wells at Landfill No. 2 from April 1986 to November 1989, rising 2.6 feet in monitoring well 6-A-1 and 2.1 feet in monitoring well 6-A-2 (Figure 4.1.6-5). The landfill is several miles east of the regional groundwater depression, which has also been rising in recent years. This small rise is consistent with the distance from the depression.

Groundwater elevations from May and March 1989 are plotted on Figure 4.1.6-6 and Plate 3; those from November 1989 are shown on Plate 4. The regional gradient west of Landfill No. 2 is approximately 0.007 foot per foot to the west northwest. The local groundwater gradient cannot be calculated with certainty because of the difference in completion-zone geology between the upgradient and downgradient wells.

The sandstone bedrock at the background monitoring well (6-C-1) at Landfill No. 2 has very low transmissivity and hydraulic conductivity. A 1.5-gpm pump test drew down more than 22 feet in an hour, giving an average transmissivity during the drawdown and recovery tests of 30 gallons per day per foot, or 4.0 square feet per day. The hydraulic conductivity was calculated to be 0.20 feet per day (7.1 x 10° cm/sec). The downgradient monitoring wells have higher transmissivities as they were successfully pumped at 7 to 8 gpm during sampling without pumping the monitoring wells dry. Plots of the aquifer tests and a discussion of the method of analysis is included in Appendix E.

An estimate of the groundwater flow velocity may be made using the results of the 72-hour multiple-well pump test conducted at Site 19, located about 4,000 feet north of Site 6 in a hydrogeologic setting similar to the unconsolidated sediments at Site 6. This test is discussed in more detail in Section 4.1.19.1.2. The average value of transmissivity obtained from the pumping well during this test was 1,700 square feet per day, while the average hydraulic conductivity was 28 feet per day (0.01 cm/sec). Using the gradient of 0.007 for the region, and an estimated effective transport porosity of 0.20, the approximate velocity of groundwater movement in the vicinity of Site 6 is about 1 foot per day, or 360 feet per year.



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4.1.6.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.5.1.4 and in Appendix A.

Soil

A total of 27 soil boring samples were collected at Site 6: three from a vertical background boring and 24 from the four angle borings under landfill trenches. These samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method).

TCE was detected in boring 6-C-4SB at 0.039 mg/kg in the 57.5-foot sample and was below the 0.007 mg/kg LOQ in the 17.5-foot sample (Figure 4.1.6-7). In boring 6-C-5SB, TCE and 1,1-DCE were tentatively identified below the LOQ of 0.031 mg/kg in the 17.5-foot sample and 0.029 mg/kg in the 27.5-foot sample. Trans-1,2-DCE was estimated in two samples in 6-C-3SB at levels below the LOQ. Toluene was detected in 24 of the 27 soil samples at up to 0.11 mg/kg.

Chlorobenzene was tentatively identified below the LOQ for three soil samples from 6-C-3SB and 6-C-5SB. The 17.5-foot soil sample in 6-C-3SB had 0.005 mg/kg with an LOQ of 0.006 mg/kg. The 17.5- and 27.5-foot samples from 6-C-5SB had 0.011 and 0.012 mg/kg detected chlorobenzene with LOQs of 0.031 and 0.029 mg/kg.

Semivolatile organic chemicals were detected in several soil samples at Site 6. 2-butanone was detected in four samples at up to 0.99 mg/kg. 4-methyl 2-pentanone was detected in three samples at up to 0.070 mg/kg. Bis(2-ethylhexyl) phthalate was estimated below the LOQ in eight samples at up to 0.37 mg/kg (which was below the LOQ). Di-n-butyl phthalate was detected in ten samples at up to 0.73 mg/kg.

ICP metals were detected in Site 6 soil samples at concentrations similar to background levels. Mercury was not detected in any sample. Cobalt was detected at 115 mg/kg in the 40-foot sample at background boring 6-C-1SB.

TFH-diesel was detected at 1.3 mg/kg and TFH-gas at 110 mg/kg at the 7.5-foot sample in 6-C-5SB. TFH-gas was found at 81 mg/kg in the 47.5-foot sample in 6-C-3SB and at 77 mg/kg at 57.5 feet in 6-C-2SB (Figure 4.1.6-7).

Groundwater and Surface Water

No groundwater contamination was detected in Phase II, Stage 1 sampling (AeroVironment, 1987).

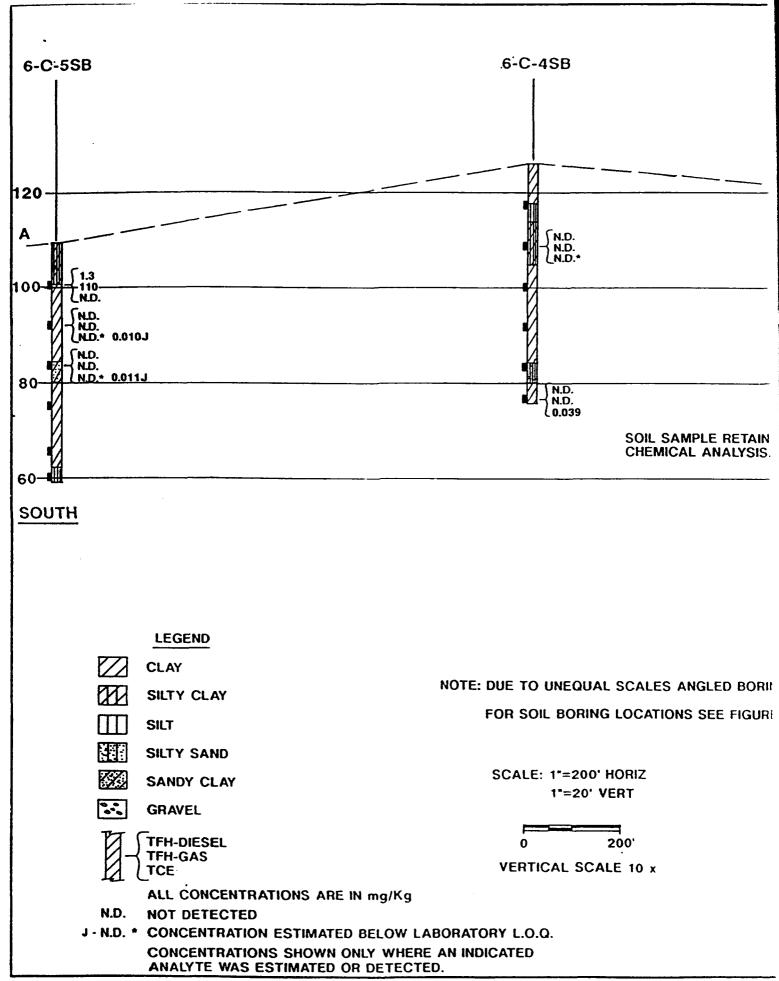
Through the four quarterly rounds of water sampling at Site 6, 12 groundwater samples and 4 surface water samples have been collected. Analyses performed for water samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7421), mercury (7470/7471), selenium (7740), water quality parameters, TFH-diesel and -gas (California method), and chemical oxygen demand (COD).

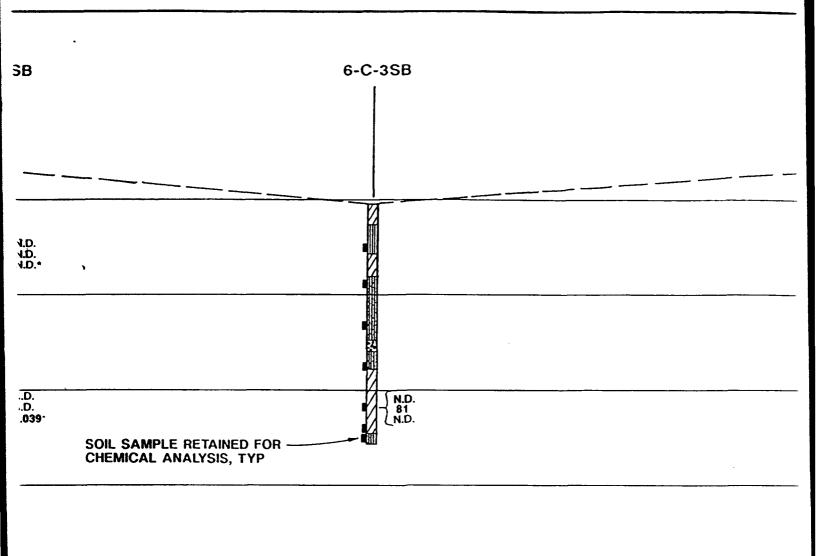
The only organic chemical detected in groundwater sampling through the third round of sampling at Site 6 was toluene. In the first quarterly sampling, toluene occurred only in background monitoring well 6-C-1 at 3 ug/l (2 ug/l in second column confirmation). This is considered to be a false positive result.

In the second quarterly sampling round (May 1989), toluene was detected in well 6-A-2 at 12 ug/l (1 ug/l in the second column confirmation); in well 6-A-1 at 1 ug/l (1 ug/l in the second column confirmation); and in well 6-C-1 at 1 ug/l (1 ug/l in the second column confirmation).

In the third round sampling, toluene was only detected in the downgradient wells: 1 ug/1 (2 ug/1 in the second column) in 6-A-1 and 9 ug/1 (4 ug/1 in the second column) in 6-A-2.

In the fourth quarterly sampling round toluene was only detected in downgradient well 6-A-2 at 2 ug/l (11 ug/l in the second column). Dichlorodifluoromethane (freon-12), a refrigerant and common laboratory contaminant, was detected in well 6-A-1 at 3 ug/l (1 ug/l in the second column). TFH-





EQUAL SCALES ANGLED BORINGS ARE PLOTTED VERTICALLY.

300

ORING LOCATIONS SEE FIGURE 4.1.6-1

=200' HORIZ

=20' VERT

200

. SCALE 10 x

FIGURE 4
TFH AND TCE CONCE
CROSS SECTION A-

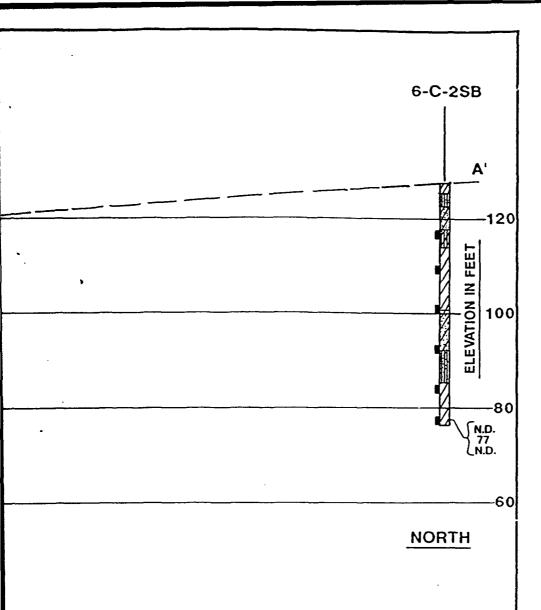


FIGURE 4.1.6-7
TFH AND TCE CONCENTRATIONS IN SOIL CROSS SECTION A-A', LANDFILL NO. 2

СКМНІЦ-

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diesel was only detected in well 6-A-2 at 0.12 mg/l. Metals and water quality parameters were similar to earlier rounds except for manganese being detected in 6-A-1 at 0.037 mg/l.

Arsenic, mercury, lead, selenium, and TFH-gas were not detected in groundwater at Site 6. In the first groundwater sampling round, COD varied from below the 7 mg/l LOQ in 6-A-2 to 7.3 mg/l in 6-C-1 up to 8.0 mg/l in 6-A-1. How-ever, COD was 9.9 mg/l in the equipment wash blank for 6-A-1. COD was not detected in any samples from the second, third, or fourth rounds.

Groundwater type varies at Landfill No. 2. Total dissolved solids in the first round were 284 and 236 mg/l at monitoring wells 6-C-1 and 6-A-2. However, TDS is much higher, 367 mg/l, in downgradient monitoring well 6-A-1, largely due to an anomalously high sulfate concentration of 115 mg/1 (109 mg/l in a replicate sample). The sulfate concentration is over 85 mg/l, higher than in any of the other base monitoring wells, except well 2-R-3 which has a similar level. Background monitoring well 6-C-1, screened in sandstone, has a predominantly sodium bicarbonate water. Water from downgradient well 6-A-2 is bicarbonate with no dominant cations. and 6-A-1 is a calcium-magnesium sulfate type. Water type did not vary significantly in the second, third, and fourth sampling rounds. Sulfate remained high in 6-A-1 (131 mg/1 in the second, 138 mg/l in the third, and 177 mg/l in the fourth round).

Nitrate plus nitrite (expressed as nitrate) in upgradient well 6-C-1 ranged from not detected in the first round to 0.80 mg/l in the second round to 2.2 mg/l in the third round and 0.35 mg/l in the fourth round, which is lower than any other well at Beale AFB. This lower nitrate may be due to recharge of fresh water from the tributary of Hutchinson Creek east of the well.

In each sampling round, one surface water sample (6-C-1SW) was taken from Hutchinson Creek immediately downstream of the Landfill No. 2 access road (Earle Road) bridge. In the first sampling round, toluene was detected at 2 ug/l (5 ug/l in second column) but was not detected in a replicate sample. The surface water was a calcium-magnesium bicarbonate type similar to groundwater at downgradient well 6-A-2 but with much lower TDS of 79 mg/l. A replicate sample had similar results.

Toluene was detected at 1 ug/1 (2 ug/l in second column) in the second round surface water sampling. Nitrate was 0.42 mg/l and COD was 13.3 mg/l. TDS increased to 164 mg/l. Water type did not change.

Toluene was detected at 10 ug/l (3 ug/l in second column) in the third round surface water sampling. Nitrate was 0.49 mg/l and COD 25.8 mg/l, similar to the first round surface water results. TDS increased to 250 mg/l. Water type did not change.

Toluene was not detected in the fourth round surface water sampling. TCE was detected at 44 ug/l in the first column result but was not detected in a second or third column run for confirmation. Therefore, TCE is not believed to be present in the sample. TFH-diesel was detected at 0.070 mg/l. Nitrate was 0.53 mg/l and COD 18.5 mg/l. Manganese was detected at 0.0682 mg/l. Arsenic, mercury, lead, selenium, and TFH-gas were not detected in surface water at Site 6.

4.1.6.1.4 Analytical Results Table

Table 4.1.6-2 presents a summary of all detected analytes for Site 6. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.6-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.6.1.5 Discussion of Analytical Data

Contaminants were detected in some soil samples collected from beneath Site 6. With the exception of the probable false positive results for toluene and the single TFH-diesel detection in the fourth round surface water sample, no contaminants were detected above LOQs in either the ground-water or surface water samples. Table 4.1.6-3 presents the range of contaminants encountered for each of the media sampled (soil, groundwater, surface water), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

TABLE 4.1.6-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 6

				Standards, and Action	Criteria Levels (a)	6-C-158 BAFB-0067	6-C-158 BAFB-0088	6-C-158	6-C-258 BAFB-0177	6-C-255	6-C-258 BAFB-0179
Parameter	Method	Detection	Unite	Federal	State		12/01/86	12/01/88	12/12/88	12/12/86	12/12/00
Percent Moisture	ASAEP	Y/H	×	\$#	\$ 2	15.7	18.7	5	9.6	19.4	21.1
Attains	50000	20.0	Mo/ko	S	SE	16100	16000	10900	10600	20500	17400
Berice	Succession 10	10.0	mo/kg	S	10,000	692	165	6.04	143	77.	112
Beryllius	St.6010	0.50	m/kg	S#	K	2	9	9	9	7.0	0.76
Calcium	S16 010	2	Z/kg	2	SE	5110	870	0%4	3810	8	2800
	S16010	3.0	g/k	4	8	X.7	37.5	37.2	37.3	4.74	37.0
Cobalt	Sta6010	0.4	Z/ks	2	8,000	22.5	6.0Z	115	21.1	28.3	22.8
Copper	St.6010	3.0	/ks	2	2,500	60.3	2.5	7.07	44.2	58.8	51.3
La	S w6010	10.0	Z/ko	*	SE	27000	31900	20700	29300	36400	38300
Meanes i um	Stu6010	5	Mo/kg	2	SE	6630	5820	5520	3810	8 100	220
Handenese	Sta6010	1.5	N/ko	*	SE	916	1050	×	733	ž	285
Bickel	Su6010	0.4	W/kg	\$	2,000	6.62	22.1	22.4	20.0	7.9%	25.3
Potagaium	Su6010	9 02	Z/kg	2	\$ 2	427	9	2	9	657	%
Sodie	Suc 010	5	Z/kg	*	S #	<u>\$</u>	202	215	223	907	387
Venedius	510542	6.0	/ko	2	2,400	£.3	8.3	62.1	63.9	5	86.9
Zinc	\$10010	2.0	No/ko	2	2,000	65.0	6.83	52.6	43.8	71.5	8.99
Methylene Chloride	S46 240	0.00	Z/kg	2	SE	0.15	0.14	0.027	0.037	0.035	0.061
Acetone	878 240	0.010	Mo/kg	Ş	SH	2	9	2	9	0.11	1.5
2-Butanone	SMB 240	0.010	MO/kg	S	SI	9	9	9	9	2	8 .0
4-Hethyl-2-Pentanone	SuB 240	0.010	Z/kg	*	**	2	9	2	2	2	0.070
Toluene	SuB 240	0.002	Z/kg	¥	Ş	0.0	0.0	0.016	0.003	0.005	0.016 J
Xylenes (total)	879 540	0.002	No/kg	*	SI	9	9	9	유	0.005	2
Phenol	57.73 57.73	0.33	MQ/kg	\$	S	1.3	2.0	1.9	1.8	8 2.16	2.0 8
bis(2-ethylhexyl)phthalate	S46273	0.33	Mg/kg	S	S	9	2	2	2	9	0.24 J
MOTES. Beaute reported for detected and	detected	5	<u> </u>			; ; ; ; ; ; ;	!			· · · · ·	•
MT: analyte not tested		}		=	analyte date	cted in blank	.		e: equi	peent week blank	l ank
The state of the s				, =		1	itantition	timit on	6. 61.01	d seed in see	

HD: analyte not detected.

HS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

		:		Standards, and Action	Criteria Levels (a)	6-C-258	6-C-258	6-C-258	6-C-358	6-C-3SB BAFB-0165	6-C-358 BAFB-0166
Parameter	Method	Detection Limit	Units	Federal	State	12/12/86	12/12/88	12/12/86	12/08/88		12/08/98
Percent Moisture	ASARP	V/H	×	SZ	S#	13.3	12.1	19.4	12.4	17.7	18.3
TFH-Gas	TFN-GA	20	10 /kg	SX	SH	9	2	1	욮	₽	2
Aluminum	\$16010	20.0	10/kg	SH	SI	0666	7650	86 10	14400	17400	9520
Barius	Su6 010	10.0	10 /kg	S#	10,000	4.89	92.5	52.1	119	57	133
Calcium	SNA 6010	<u>5</u>	mo/kg	S#	SI	34.80	3250	3460	2970	3850	2800
Chromica	SW6 010	3.0	20/kg	SE	200	18.5	56.6	14.9	4.4.	14.6	7.2
Cobalt	SU6 010	4.0	20/kg	SH	8,000	11.5	14.8	5.5	21.7	10.6	9.8
Copper	Sw6010	3.0	mo/kg	SH	2,500	43.1	39.0	31.5	41.2	14.6	14.7
Iran	Sw6010	10.0	mg/kg	SH	SE	20600	23500	13500	30600	19600	12200
Magnesium	S146010	5	20/kg	SE	SE	3778	904	3310	3220	3100	2480
Manganese	State 010	1.5	mg/kg	SE	SE	453	244	230	930	558	517
Nickel	Su6010	4.0	mo/kg	SH	2,000	16.1	12.5	10.4	13.7	12.2	7.1
Potassium	SW6 010	8	MO/kg	SE	SH	752	307	9 62	411	413	636
Sodium	Su6010	5	mo/kg	SH	SE	23.	174	252	=	237	187
Vanadius	Su6010	0.4	mg/kg	SH	2,400	65.1	2.0	31.0	114	39.9	27.4
2 inc	Sta6010	2.0	mg/kg	SH	2,000	45.9	1.7	32.6	43.2	42.0	41.7
Methylene Chloride	SNB240	0.002	mo/kg	SI	SE	0.032	0.038	0.038	0.00	- 600.0 r	3 0.011 8
Acetone	SMB240	0.010	mg/kg	S	SH	2	0.013	2	0.018	0.016	3 0.024 B
trans-1,2-Dichloroethene	SWB240	0.002	mo/kg	SH	S	9	2	2	윺	0.00	0.005
2-Butanone	SMB240	0.010	mg/kg	SH	SX	2	₽	2	윺	2	0.006
2-Hexanone	SMB240	0.010	mg/kg	ST	SE	2	2	2	욮	900.0	2
Toluene	SMB240	0.002	mg/kg	SE	SX	0.004	욡	3	0.021	0.0%	0.083
Chlorobenzene	SMB240	0.005	10/kg	S	SX	2	2	2	2	0.002	2
Phenol	Su6270	0.33	20/kg	SI	SH	2.0	1.7	1.9	2	2	2
Di-n-butylphthalate	SW6270	0.33	mg/kg	SE	SE	2	2	2	0.54	0.73 E	0.26 J
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	SE	SN	2	2	2	2	9	0.078
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B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. NT: analyte not tested

ND: analyte not detacted. NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix i.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.6-2 (continued)

				Standards, Candards, Canda	Criteria Levels (a)	6-C-358 BAFB-0167	6-C-358 BAF8-0168	6-C-388 BAFB-0169	6-C-358' BAFB-0170	6-C-4SB BAFB-0228	6-C-4SB BAFB-0229
Parameter	Method	Detection Limit	Units	Federal	State	12/08/88	12/08/88	12/08/88			12/12/88
Derrent Moieture	ASARO	W/M	**	WS	SN	18.5	20.5	18.2		17	27.9
	TEN-GA	9	mo/ka	S	SE	2	2	윺		2	2
		20.0	o/ko	S	SE	11100	15300	13100	0969	13600	27200
	S C C C C C C C C C C C C C C C C C C C	10.01	mo/ko	S	10.000	133	573	428		159	241
	01097	100	mo/ko	SE	SE	2980	7520	6330		7450	13200
	010978	0.5	a/ka	SE	209	10.7	31.3	30.9		44.1	33.8
	0100	0.4	DA/KO	S	8.000	10.3	42.0	35.6		11.1	16.6
Const	Su6010	3.0	ma/ka	SH	2,500	18.4	47.6	43.0		6.95	51.3
1001	010342	10.0	o/ko	SZ	SE	14700	25200	25700		35800	30200
Maconerium	S16010	100	mo/ka	S#	SE	2430	6520	5110		7140	7730
Monaposa	010975	1.5	mo/ka	SE	SE	615	2430	2030		340	598
in the last of the	Su6010	0.4	mo/ko	SE	2,000	9.3	25.2	27.8		54.6	35.4
Dotassin	SUK010	200	mo/ko	SE	SE	577	805	1220		277	555
	010975	100	pa/ka	Ş	S	172	\$	191		₹ 8	588
i pica	010375	0.4	o/ko	SE	2.400	59.6	39.6	97.9		119	51.3
2 inc	010	2.0	o/ka	SE	2,000	41.2	1.67	45.1		63.5	83.8
Methylene Chioride	S-6240	0.005	mo/ka	SE	SE	0.007	8 0.005	B J 0.005	-	0.029	0.042
Acetone	Su6240	0.010	mo/kg	SH	SE	0.022	960.00	8 0.015		욡	윺
2-But anone	S18240	0.010	mo/ka	SH	SE	0.007	₽	0.00	7	욮	皇
richloroethene	S46240	0.005	mo/ko	SH	2,040	9	9	9		Q	0.005
Benzene	SAB240	0.00	mg/kg	SH	SE	2	2	2		皇	0.005
4-Methyl-2-Pentanone	SW6240	0.010	mo/kg	SH	SE	2	2	2	윷	욮	0.00
Toluene	S-16240	0.005	mo/ko	SR	SE	0.11	2	0.062	0.046	0.020	0.058
Phenol	SUB270	0.33	mo/ko	SE	SE	2	2	2	2	.	8 2.1
0i-n-butvichthalate	S46270	0.33	mo/ko	S¥	S#	9	97.0	Q#	0.21	37.0	2
his 22-ethylhexyl Johthalate	Sure 70	0.33	mg/kg	SE	SE	0.080	9	0.16	0.085	9	0.24

MOTES: Results reported for detected analytes only.

MI: analyte not tested

MI: analyte not tested

MI: analyte not detected.

MI: detection limits are for delution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Percent Moisture Method Limit Units Fe FFH-Diesel TFH-DI 1.0 mg/kg TFH-DI 1.0 mg/kg TFH-Diesel TFH-DI 1.0 mg/kg	5	26 28 38 38 38 38 38 38 38 38 38 38 38 38 38	26.5-28.0° 36.5-38.0° 12/13/88 12/13/88 22.7 20.3 ND ND ND 16300 11200 203 11200 5760 4540 40.6 21.3 20.7 17.6	20.3 13.5 20.3 13.5 ND ND N	204.00 12/13/88 45 ND 204.00 159 0.91 9650 11.1	20.3 20.3 1.3 1.3 1.3 1.0 24500 228 ND	17.5-19.0' 12/09/88 12/09/88 21.3 ND ND 23000 118
ter Method Limit Units F t Moisture ASA49 N/A X esel TFH-D1 1.0 mg/kg s SM6010 20.0 mg/kg ium SM6010 10.0 mg/kg su6010 200 mg/kg su6010 0005 mg/kg su6010 0005 mg/kg su6010 0005 mg/kg su6010 0005 mg/kg	Chits		•	•	20400 20400 159 0.91 11.1	;	21.3 ND ND 23000 23000 118
t Moisture ASA#9 M/A seel TFH-DI 1.0 succold 20.0 succold 10.0 succo	70 Kg	000 2, 200 2, 200 2, 200 3, 200 4, 200 5, 20				20.3 1.3 110 24500 228 228 ND	21.3 ND ND 23000 118
### TFH-DI 1.0 #### Sadono 20.0 #### Sadono 10.0 ### Sadono 10.0 #### Sadono 10.0 ### Sadono 10.0 #### Sadono 10.0	20/kg 20/kg	0, 00 2, 500 2, 500 2, 500 2, 500 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8				1.3 110 24500 228 ND	ND 23000
TFN-GA 50 SM6010 20.0 SM6010 10.0 SM6010 0.50 SM6010 10.0 SM6010 4.0 SM6010 10.0 SM6010 2.0 SM6240 0.005 SM6240 0.005	20/kg	2,500 2,500 2,500 2,500 2,500				110 24500 228 28 80 80	23000 118
Succord 20.0 Succord 10.0 Su	# # # # # # # # # # # # # # # # # # #	2, 500 2, 500 2, 500 2, 500 3, 500 3, 500 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8				24500 228 ND 5540	23000
Subsider 10.0 Subsid	#0/kg #0/kg #0/kg #0/kg #0/kg #0/kg	10,000 75 88 2,000 2,500 2,500				228 ND 55.65	118
Subsolo 0.50 Subsolo 0.50 Subsolo 100 Subsolo 4.0 Subsolo 10.0 Subsolo 10.0 Subsolo 10.0 Subsolo 10.0 Subsolo 10.0 Subsolo 10.0 Subsolo 200 Subsolo 20	### ### ### ### ### ### ### ### #### ####	2,500 2,500 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8				Q# 5755	
Su6010 100 Su6010 3.0 Su6010 4.0 Su6010 3.0 Su6010 10.0 Su6010 10.0 Su6010 1.5 Su6010 4.0 Su6010 4.0 Su6010 6.0 Su6010 200 Su6010 6.0 Su6010 0.005 Su6010 0.005 Su6010 0.005	### ### ### ### ### ### ### ### ### ##	2,500 8,000 2,500 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8				2555	윺
suco10 3.0 suco10 3.0 suco10 3.0 suco10 3.0 suco10 10.0 suco10 1.5 suco10 1.5 suco10 1.5 suco10 1.5 suco10 1.5 suco10 1.0	MO/KG MS	500 8,000 2,500 88				3	6810
Su6010 4.0 Su6010 3.0 Su6010 10.0 Su6010 10.0 Su6010 10.0 Su6010 1.5 Su6010 2.0 Su6010 4.0 Su6010 2.0 Su6010 2.0 Su6010 2.0 Su6010 2.0 Su6010 0.005 Su6240 0.005	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	8,000 2,500 HS NS				48.6	41.4
su6010 3.0 su6010 10.0 su6010 10.0 su6010 10.0 su6010 1.5 su6010 1.5 su6010 1.5 su6010 100 su6010 100 su6010 2.0 su6010 2.0 su6010 2.0 su6010 su6010 100 su6010 su6	20/kg 20/kg	2,500 #S				22.6	25.4
Subsider 10.0 Subsider 10.0 Subsider 1.5 Sub	20/kg 20/kg 20/kg 20/kg 20/kg	S S				52.9	63.2
ium Su6010 100 11.5 su6010 1.5 su6010 1.5 su6010 1.5 su6010 4.0 su6010 4.0 su6010 4.0 su6010 2.0 su6010 2.0 su6010 2.0 su6010 su6010 2.0 su6010 su601	Mg/kg NS Mg/kg NS	SE				34300	40000
Su6010 1.5 Su6010 4.0 Su6010 200 Su6010 200 Su6010 4.0 Su6010 4.0 Su6010 4.0 Su6010 6.0 Su6010 0.005 Chloroethere Su6240 0.005	MQ/kg NS					0099	7670
Su6010 4.0 Su6010 200 Su6010 100 Su6010 4.0 Su6010 4.0 Su6010 2.0 Su6010 0.00 Su6240 0.005	mg/kg NS	S¥				22	818
suco10 200 mm suco10 200 mm suco10 200 mm suco10 4.0 mm suco10 2.0 mm suco10 2.0 mm suco10 0.005 mm suco240 0.010 mm suco240 0.005 mm suco440		2,000				٥. پر	32.4
Su6010 100 ms su6010 4.0 ms su6010 2.0 ms su6010 2.0 ms su6240 0.005 ms su6240 0.010 ms su6240 0.005 ms	SN BY/BH	SH				255	839
su6010 4.0 m su6010 2.0 m su6010 2.0 m su6240 0.005 m su6240 0.010 m su6240 0.010 m su6240 0.005 m	MO/kg NS	SH				222	215
SM6010 2.0 ne Chloride SM6240 0.005 m SM6240 0.010 m SM6240 0.005 m	MS/kg NS	2,400				67.3	=
ne Chloride SM6240 0.005 m SM6240 0.010 m Noroethene SM6240 0.005 m	MG/kg MS	2,000				59.5	83.0
SMB240 0.010 m	mg/kg NS	SX				0.25 B	0.18 B
hloroethere SW8240 0.005 m	ma/kg ws	SH		-		0.15 B	0.030
	mg/kg NS	SH				Q	0.010
SW8240 0.005	mo/kg MS	2,040				웆	0.010
SUB240 0.005	mo/kg NS	SE				욮	0.012
SM6240 0.005	ma/kg NS	Ş		023 0.006		0.22 J	0.017 J
anzene Su6240 0.005 m	mg/kg NS	Ş				욮	0.011
Su8270 0.33	MQ/Kg NS	SE	20	•	•	2.18	2.0 B
utviphthalate SW8270 0.33	MS BY	Ş				2	2
thatate SW8270 0.33 m	mg/kg NS	SE				0.28 J	0.37 J

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) MD: analyte not detected.
MS: No standard criteria or action level currently exists. NOTES: Results reported for detected analytes only. MT: analyte not tested

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.6-2 (continued)

				Standards, and Action	Criteria Levels (a)	6-C-5SB BAFB-0173 B	6-C-588 BAFB-0174	6-C-5SB BAFB-0175	6-C-5SB BAFB-0176	
Parameter	Method	Limit	Units	Federal	State		. '	12/09/88	12/09/88	:
Percent Moisture	ASA#9	V/R	×	SN	SE	16.3	14.4	11.6	43.3	
Atuaine	S46010	20.0	ma/ko	SH	SE	19700	14000	13900	19000	
Berick	Su6010	10.0	mg/kg	S	10,000	131	161	5	53	
Beryllica	Su6 010	0.50	mo/ka	SZ	K	2	윤	욮	0.88	
Calcius	S46010	5	mo/ko	SE	SE	0609	4210	9300	0986	
Chronium	Suc010	3.0	mo/kg	SE	200	53.9	28.5	29.5	6.6	
Cobalt	Su6010	4.0	mo/kg	SE	8,000	28.0	19.9	15.8	11.3	
Copper	Succo10	3.0	mo/kg	SE	2,500	55.9	28.2	\$6.5	31.7	
lo.	Succo10	10.0	mo/kg	SE	SZ	39500	25100	56800	9450	
Magnesius	Su6010	5	mo/kg	SH	SZ	0009	3910	6070	35.70	
Manganese	SW6010	1.5	mo/kg	SE	SZ	1040	873	6 20	1020	
Mickel	Suc 010	4.0	mo/ko	SE	2,000	27.0	18.7	17.0	15.3	
Potassium	Su6010	00 2	mo/kg	SM	SZ	265	욮	373	767	
Sodium	Su6010	5	mg/kg	SE	SZ	203	192	220	303	
Theilie	Sta6010	50.0	mg/kg	SN	8	웊	9	73.5	9	
Vanedium	SW6010	4.0	mg/kg	SE	2,400	141	78.5	7.02	17.3	
Zinc	SW6010	2.0	mg/kg	SE	2,000	68.2	41.6	89.9	36.0	
Methylene Chloride	SHB240	0.002	mo/kg	SN	SH	0.19 8	0.15 8	0.19	B 0.25 B	
Acetone	SW6240	0.010	mo/kg	SE	SE	0.032 BJ	0.059 B	0.071	B 0.096 B	
1.1-Dichloroethene	SW8240	0.003	mo/kg	SE	SE	0.012 J	ş	æ	윭	
Trichloroethene	SIMB240	0.002	Mo/kg	SM	2,040	0.011	욮	₽	욮	
Benzene	SW8240	0.00	mg/kg	SE	SE	0.013 J	2	2	윺	
4-Methyl-2-Pentanone	SUB240	0.010	MQ/kg	SN	SE	9	2	2	0.022 J	
Totuene	SM8240	0.00	mg/kg	SE	S¥	0.021	0.014	0.042	0.020	
Chlorobenzene	SHB240	0.005	mg/kg	SZ	SH	0.012 J	ş	윺	2	
Phenol	S48270	0.33	mg/kg	SN.	SH	2.2 8	1.9 8	2.0	3 2.8 8	
2-Chlorophenol	SUB270	0.33	mg/kg	SH	SH	2	윺	0.20	2	
bia(2-ethylhexyl)phthalate	SW6270	0.33	mg/kg	SX	S	2	윺	0.33	2	

e: equipment wash blank f: field replicate R: resample

NOTES: Results reported for detected analytes only.

NT: analyte not tested

NT: analyte not tested

ND: analyte not detected.

ND: detected in () are 2nd column confirmation values.

ND: values listed in () are 2nd column confirmation values.

ND: values represent most stringent standard, criteria or action level. See Appendix 1.

ND: Analyte of the State of California Standard of 45 mg/l for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.6-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 6

		201	_	Standards, and Action	Criteria Levels (a)	6-C-1GV	6-A-1GW	6-A-1GW	6-A-1GLF	6-A-1GW ^{RI}	
Parameter	Method	Limit	Units	Federal	State	03/22/89	03/23/89	04/20/89	03/23/89		03/23/89
Specific Conductivity	£120.1	0.1	umhos/cm	SE	906	008	007	435	007	435	
Temperature	E170.1	V/N	deg C	SH.	SE	22.0	19.0	20.0	19.0	20.0	=
-	E150.1	W/W	ŧ	2-9	SH	8 .6	7.05	7.14	7.05	7.14	
Alkalinity - Total	S# 603	0.1	7/00	2	SN	154.8	75.2	T.N	70.8	E	=
Bicarbonate	SH 403	1.0	7	SH	SE	188.9	91.7	Ħ	4.98	H	=
Total Dissolved Solids	£160.1	3.0	1/0	200	500	787	367	Ħ	371	H	10.0
Chloride	E325.3	1.0	7	250	220	34.2	29.5	Ħ	32.4	H	*
Fluoride	E340.2	0.020	1/02	7	1.4	0.22	0.18	Ħ	0.17	H	불
Eltrate + Eltrite	E353.3	0.020	7	5	45	욮	16.0	H	16.0	Ħ	0.15
Sulfate	E375.4	1.0	7	250	250	17.7	115	T R	109	E	-
Chemical Oxygen Demand (COD)	E410.4	7.0	1/0	SR	SE	7.3	8.6	Ħ	9.0	H	6
Calciu	SW6010	.8	1/0	SE	SE	28.8	43.5	Ħ	41.2	H	¥
5	Suco10	0.100	1/02	w.	'n	2	0.116	H	0.379	H	¥
Magnesium	S46010	9:	<u> </u>	SE	SE	10.5	21.8	H	20.6	X	¥
Manganese	Su6010	0.0150	7	8	S	윺	0.0770	H	0.0830	H	*
Potassium	S46010	5.8	7/02	SN	SN	2.30	1.8	H	5.1	H	¥
Sodium	Su6010	. 8	7/02	SX	SE	24.4	56.4	H	22.0		呈
Zinc	Su6010	0.0500	7	0.110	0.012	2	2	H	2	Ħ	0.0370
Toluene	SWB020	-	1/80	14,300	9	3(2)	9	Ħ	2	¥	물
M-Mitrosodiphenylamine (1)	SW8270	2	1/80	SE	SH	2	Ħ	m	BJ NT	7	8
Di-n-Butylphthelate	Su6270	2	700	SE	SE	2	Ħ		BJ NT	-	
bis(2-Ethylhexyl)Phthalate	S46270	5	1/80	SR	SN	2	Ħ	4	BJ NT	4	B.J. NE

NOTES: Results reported f NT: analyte not tested ND: analyte not detected.

e: equipment wash blank f: field replicate

R: resample

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) MS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.6-2 (continued)

				Standards, Cr and Action Le	Criteria Levels (a)	6-A-1GL ^b	6-A-26W	4ST-2-9	6-c-1su	6-C-1SV	6-c-1su ^b
Parameter	Method	Detection Limit	Chits	Federal	State	BAFB-0506 03/23/89	BAFB-0509 03/23/89	BAFB-0483 03/09/89	BAFB-0484 03/09/89	BAFB-0485 03/09/89	BAFB-0486 03/09/89
Specific Conductivity	£120.1	1.0	Carbos/Ca	SE	8	Ħ	170	88	85	=	=
Temperature	E170.1	N/A	0 500	SI	SN	×	18.0	14.0	14.0	T.R	R
· **	E150.1	N/N	₹.	2-0	SN	Ħ	8.01	7.22	7.09	I	
Alkalinity - Total	SPK 03	1.0	7	2	SH	¥	74.0	32.8	26.8	H	12
Bicarbonate	SP# 03	1.0	/ 2	SR	NS	**	80.3	0.04	32.7	=	H
Total Dissolved Solids	E160.1	3.0	1 /0	200	200		236	9.0	83.0	8.0	=
Chloride	E325.3	1.0	7	220	220	H	5.5	4.0	4.0	1.5	H
Fluoride	E340.2	0.020	7	~	1.4	F	0.22	ş	욡	웆	2
Mitrate + Mitrite	E353.3	0.020	7	10*	45	H	23.7	2.2	1.6	2	H
Sulfate	E375.4	1.0	7	220	250	Ħ	7.5	5.3	5.1	욮	Ħ
Chemical Oxygen Demand (COD)	E410.4	7.0	7	SH	SN	H	ş	18.5	20.8	9	×
Celcium	Suc 010	8.	7	SH	SH		15.0	2.2	7.91	2	
Iron	StA6010	0.100	/	r;	w.		皇	0.201	0.185	⊋	Ħ
Megnes i un	Su6 010	 8	/	W	SN	-	6.74	4.93	5.01	욡	F 3
Potassium	Su6010	9.	/	SE	SE	=	1.20	2	윷	윺	=
Sodium	Succo10	9.	1/0	SR	SE	H	15.3	2.4	4.93	웆	×
Toluene	SWB020	-	7	14,300	100	2	9	7	₽	₽	Ş

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) MS: No standard criteria or action level currently axists. NOTES: Results reported for detected analytes only. NT: analyte not tested ND: analyte not detected.

(): values listed in () are Ind column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen Which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.6-2

BEALE AFB: WATER DATA ZND ROWND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 6

				Standards, Cand Action L	Criteria Levels (a)	6-C-16W	6-A-1GV	6-A-2GU	6-C-15W	
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0549 05/25/89	8AFB-0548 05/25/89	BAFB-0547 05/24/89	8AFB-0585 06/09/89	
Special Conductivity	F120.1	1.0	umpos/cm	SX	8	420	430	165	230	
Tomocratics	F170.1	4/8	J oak	S	WS	20.0	19.0	19.2	23.0	
, , , , ,	E150.1	K/8	ā	2-9	SH.	7.91	7.03	7.76	7.23	
Alkalinity - Total	SH403	1.0	1/0	2	SE	160.0	72.0	9.69	83.6	
Bicarbonate	S94,03	0.	7	SE	S	195.2	87.8	8.0	102.0	
Total Dissolved Solids	E160.1	M.	1/0	200	200	319	397	3	<u>\$</u>	
Chloride	E325.3	1.0	7	220	250	38.8	25.9	5.4	28.1	
fluoride	E340.2	0.050	7	~	1.4	0.18	0.14	0.17	0.16	
Eiribes + Eirits	£353.3	0.020	1/04	ē	45	6.0 2.0	17.5	23.3	0.42	
Sulfate	E375.4	1.0	1/02	220	220	23.1	131	11.7	2.3	
Chemical Oxygen Demand (COD)	E410.4	7.0	\	SE	SE	2	₽	2	13.3	
Calcin	SU6010	9.0	\	SE	SE	27.4	43.2	12.7	16.3	
200	St.6010	0.100	/0	'n	ĸ.	2	2	2	0.112	
Megnesica	SU6010	9	- - - -	SN	SE	10.0	20.7	6.35	11.5	
Mananese	SW6010	0.0150	7	ę.	5	윺	0.304	윤	2	
Potagatia	Su6010		/2	SN	SN	2.	1.10	æ	Ş	
Sodiu	Su6010	9.	7	SE	SH	49.7	23.5	15.3	16.4	
Methytene chioride	SUB010	.	\d \d \d	SX.	SZ	2	2	3	6(19)	
Trichlorofluoromethane	Su8010	-	\ \ \ \ \	SH	3,400	웆	2	2	-	
Toluene	SW8020	-	1/80	14,300	5	13	£	12(1)	1(2)	
N-Mitrosodiphenylamine (1)	S46270	5	1/85	SE	SE	'n	. 2	9	. 6 BJ	
bis(2-Ethylhexyl)Phthelate	SW8270	2	1/85	S	S	욮	2	•	2	

e: equipment wash blank f: field replicate R: resample B: enalyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) ND: enalyte not detected. NS: No standard criteria or action level currently exists. NOTES: Results reported for detected analytes only. MT: analyte not tested

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. (): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

TABLE 4.1.6-2

BEALE AFB: MATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 6

				and Action Levels (a	_		6-A-1GW	6-A-2GH	6-C-1SW
Parameter	Method	Detection Limit	Units	Federal		BAFB-0605 B 08/25/89	BAFB-0606 08/28/89	BAFB-0607 08/28/89	BAFB-0608 08/28/89
Specific Conductivity	E120.1	1.0	Lathos/cm	;	8	412	432	162	463
Temperature	E170.1	W/W	o G G		SE	20.5	19.0	20.5	21.0
	E150.1	4/N	₹.		SE	2.8	8.9	7.40	7.55
Alkelinity - Total	S94 03	1.0	Ž	2	SH	160.0	7.99	62.8	74.4
Bicarbonate	SPK 03	1.0	Ž	SE	S	195.2	81.0	76.6	8.08
Total Dissolved Solids	E160.1	3.0	1/0	500	8	263	397	215	220
Chloride	E325.3	1.0	7	220	220	38.0	23.5	5.7	54.1
Fluoride	E340.2	0.050	7	~	4.1	0.16	0.12	0.18	0.80
Eitrote + Eitrite	E353.3	0.020	Ž	ē	5	2.2	16.2	24.5	0.49
Sul fete	E375.4	1.0	7	9 %	ŝ	21.3	138	10.8	2
Chemical Oxygen Demand (COD)	E410.4	7.0	7	SE	SE	욮	2	욮	25.8
Celcium	Su6010	9.5	7	SI	¥	28.1	9.44	11.6	22.9
Hegnes i un	Stu6010	-	7	SE	SR	10.9	22.0	6.76	16.0
Nanganese	SW6010	0.0150	7	હ	S	윺	0.0760	0.0310	0.0263
Potassium	Su6010	- 8:-	7	SE	S¥	1.40	욮	욡	1.7
Sodium	Su6010	8.	7	SE	Ş	54.1	21.5	16.5	30.2
Toluene	SHB020	-	7/97	14,300	훋	2	1(2)	6(4)	10(3)
M-Witrosodiphenylamine (1)	SMB270	2	- - -	SE	¥	78.	1 2 1	9	F8 9 F8
bis(2-Ethylhexyl)Phthalate	SH6270	2	7	SN	SE	5 0	2	2	2

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NS: No standard criteria or action level currently exists. WOTES: Results reported for detected analytes only. MT: analyte not tested ND: analyte not detected.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.6-2

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 6

	•	•		Standards, and Action	Standards, Criteria and Action Levels (a)	6-C-1GW		4-2GU	6-C-15W	
Parameter	Method	Detection Limit	units.	Federal	State	11/18/89	11/15/89	11/15/89	12/05/89	
Specific Conductivity	E120.1	1.0	Carbos/CB	SE	08	007	435	5	02	
Temperature	E170.1	_	oes C	SZ	SE	18.5	18.5	19.0	6.5	
75	E150.1	N/A	7	2-9	SE	7.97	96.9	7.50	6.79	
Alkalinity - Total	SPK 03	1.0	· /2	2	SH	151.6	78.4	71.4	8.07	
Bicarbonate	STK 03	1.0	Ž	SE	SE	185.0	8.8	87.1	8.67	
Total Dissolved Solids	E160.1	3.0	7	200	200	%	316	7	8.0	
Chloride	E325.3	1.0	7	220	9 2 2	35.5	34.2	5.9	9.9	
Fluoride	E340.2	0.050	7	~	1.4	0.20	0.15	0.20	2	
Mitrate + Mitrite	E353.3	0.020	7	10*	57	0.35	9.1	14.5	0.53	
Sulfate	E375.4	1.0	1/0	250	250	21.7	111	6.5	7.0	
Chemical Oxygen Demand (COD)	E410.4	7.0	\ <u>\</u>	SZ	SX	Ħ	욯	2	18.5	
TFH-Diesel	TFH-DI	0.020	/0	SE	SN	9	2	0.12	0.070	
Calcium	SW6010	1.00	7/01	SN	SH	28.8	42.4	14.1	7.82	
iron	Su6010	0.100	/	m.	ĸ.	9	2	윺	0.101	
Megnes i um	SW6010	2.0	7	SZ	SN	10.0	21.4	6.58	4.38	
Manganese	SIM6010	0.0150	7	5	ę.	2	0.0367	2	0.0682	
Potassium	Su6010	2.0	7	SH	S	1.26	9	2	1.17	
Sodium	Su6010		7	SE	SH	53.2	24.0	16.4	4.83	
Dichlorodifluoromethane	Su 6 010	_	7/85	SH	SH	2	3(1)	2	£	
Trichloroethene	SMB010	-	7	S	5	2	2	2	(0)	
Toluene	SMB 020	-	795	14,300	<u>\$</u>	2	2	2(11)	2	
N-Nitrosodiphenylamine (1)	SMB270	5	1/80	SR	SX	•	9	욡	٦,	
Di-n-Butylphthelate	Su6270	2	7	SN	S	9	윺	2	78.9	
bis(2-Ethylhexyl)Phthalate	Su6270	2	1/6 5	SE	SN	•	2	2	Đ	
MOTES: Results reported for detected and	detected ar	nelytes only.	اراد مالاد						2	
WT: analyte not tested				ä		analyte detected in blank	¥		e: equipment wash blank	
MD: analyte not detected.				-	estimated va	ilue, below o	estimated value, below quantification	on limit	f: field replicate	
•	action leve		currently exists.	ق	field blank	(ambient co	field blank (ambient condition blank)	⊋	R: resample	
And the lies of head in the same	The Day of the same of the sam	Total Parties	aries coite	9						

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l ror Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Table 4.1.6-3
RANGES OF CONTAMINANTS DETECTED AT SITE 6

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
TFH-diesel	mg/kg	ND	1.3	1/27
TFH-gas	mg/kg	ND	110	3/27
toluene	mg/kg	ND	0.22	24/27
2-butanone	mg/kg	ND	0.99	4/27
4-methyl-2-pentanone	mg/kg	ND	0.070	3/27
chlorobenzene	mg/kg	ND	(0.012)	3/27
trans-1,2-dichloroethene	mg/kg	ND	(0.005)	2/27
1,1-dichtoroethene	mg/kg	ND	(0.012)	2/27
trichloroethene	mg/kg	ND	(0.039)	4/27
bis(2-ethylhexyl) phthalate	mg/kg	ND	(0.37)	8/27
di-n-butyl phthalate	mg/kg	ND	0.73	10/27
GROUNDWATER				
toluene	ug/l	ND	12	7/12
TFH-diesel	mg/l	ND	0.12	1/12
SURFACE WATER				
toluene	ug/l	2	10	3/4
TFH-diesel	mg/i	ND	0.070	1/4

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the $\ensuremath{\mathsf{LOQ}}$.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. These detections may represent laboratory "noise" and some of the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study, the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.6.2 Sampling or Analytical Problems

4.1.6.2.1 Loss of Samples

There were no sample loss problems for Site 6 samples. One groundwater sample from well 6-A-1 in the first quarterly sampling round was resampled for semivolatile organic analysis due to a violation of holding times. Another first quarter groundwater sample (well 6-A-2) was not analyzed for semivolatile organics due to a laboratory handling problem. The omission of this analysis is not considered critical to the final evaluation of site conditions as the well was sampled in later rounds.

4.1.6.2.2 Likelihood That Positive Samples Were Contaminated in the Field or Laboratory

Soil and water samples collected at Site 6 contained several organic compounds that may be laboratory or field induced false positive results. Phenol was detected in most of the soil samples at concentrations of 1.3 mg/kg to 2.8 mg/kg. This has been traced to a factory-contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Many of the soil samples collected also contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks at similar concentrations.

In one first quarter groundwater sample (6-A-1), the semi-volatile compounds bis-(2-ethylhexyl) phthalate, di-n-butyl phthalate, and n-nitrosodiphenylamine were estimated below the LOQ and were also found in the method blank at similar

levels. The second quarter surface water and third quarter groundwater and surface water samples had n-nitrosodiphenylamine detected below the LOQ and in the method blanks. Di-n-Butylphthalate was detected below the LOQ in the sample and the method blank in the fourth quarter sample from well 6-C-1.

Dichlorodifluoromethane (Freon 12) was detected at 3 ug/l (1 ug/l in the second column) in the fourth quarter sample from 6-A-l. This is a refrigerant which is a laboratory contaminant and is judged not to be from the groundwater.

Toluene was detected in all but three of the 27 soil samples, one of the three first round groundwater samples, and in the first round surface water sample. The maximum concentration in soils was 0.11 mg/kg. In the second quarter, toluene was detected in three groundwater samples and the surface water sample. In the third quarter, toluene was detected in two groundwater samples and the surface water sample. In the fourth quarter, toluene was only detected in one groundwater sample. The maximum concentration in groundwater was 12 ug/l (second round) and in surface water was 10 ug/l (third round). While toluene is not considered a common lab contaminant and was not detected in laboratory or field blanks at this site, the ubiquitous distribution makes the results suspect as positive detections.

During the collection of first quarter water samples, two ambient condition blanks (field blanks), and two equipment wash blanks were collected. All of these samples were free of contamination.

One soil replicate sample and two first quarter water replicate samples were also collected at Site 6. A comparison of results for the environmental samples versus the corresponding replicate samples shows that the analysis results are very similar. Some variability exists for metals in the soil samples, but this is expected since the two samples were not combined and homogenized in order to minimize loss of volatile compounds. The replicate sample of the first round surface water did not detect toluene, which was found in the corresponding environmental sample at 2 ug/l (5 ug/l in second column). This further supports the possibility that toluene is a false positive result.

4.1.6.2.3 Analytical Results Obtained Under Out-of-Control Conditions

Following the semivolatile analysis of the first quarter groundwater sample from well 6-A-1, it was noted that three of the six surrogate spike recoveries were below the acceptable percent recovery range, and one was above. All analytes were nondetectable in the sample. The surrogate recovery for volatile organic analysis of the fourth quarter sample from well 6-A-1 exceeded the allowable percent recovery by 2 percent. One of the six surrogate spike recoveries for the semivolatile organic analysis for well 6-C-1 was 1 percent below the acceptable range.

4.1.6.2.4 Corrective Actions Applied to Out-of-Control Events

The corrective action for the groundwater sample discussed above included the re-analysis of the sample. Although the re-analysis results were within acceptable recovery limits, the holding time for the sample had been violated. This sample (BAFB-0507) was resampled for the semivolatile fraction, re-analyzed, and reported in the data as sample BAFB-0532.

4.1.6.3 Significance of Findings

Soil

The soil sampling program at Site 6 involved collecting 27 samples from 5 borings. TFH-gas compounds were detected in two unrelated locations in angled borings: at 57.5 to 59 feet (actual vertical depth of 50 feet) in 6-C-2SB (77 mg/kg) and at 7.5 to 9 feet (7 feet vertically) in 6-C-5SB (110 mg/kg). TFH-diesel was detected at 1.3 mg/kg in the latter sample. However, since TFHs or associated organic compounds were not detected in the groundwater at Site 6, it cannot be concluded whether the detected TFHs are affecting the environment.

Aside from the probable false positive results for acetone, methylene chloride, toluene, phenol, and phthalates, several organics were detected in the soil samples from Site 6. Benzene, chlorobenzene, 4-methyl-2-pentanone, TCE, 2-butanone, trans-1,2-DCE, 1,1-DCE, 2-hexanone, total xylenes, and 2-chlorophenol, were all detected in samples from the angled borings drilled beneath the landfill at various locations and depths. Most of these compounds were found at or below

the LOQ. DHS TTLCs are not available for any of these compounds. These compounds were not detected in the background boring nor in the angled boring samples taken at approximately 7.5 to 9 feet (7 feet vertically) which would not be below the trenches. These compounds were most common in the 17.5- to 19- and 27.5- to 29-foot samples (16 and 24 feet vertically) which would be below the trenches. This suggests that contaminants have been released to the soil from the landfill, but at very low concentrations.

Groundwater

One background well (6-C-1) was constructed at Site 6. This well plus two existing wells were sampled during Stage 2-1. The background well encountered sandstone at a depth of 55 feet. Downgradient wells installed during previous studies (6-A-1 and 6-A-2) were completed in unconsolidated materials and did not encounter bedrock. Groundwater was encountered in the three wells at elevations ranging from 34 to 56 feet above NVGD. The large head difference across the site appears to be related to well completions in different geologic units.

Water levels have risen only slightly at this site, compared to previous and current data from IRP sites to the west of Site 6. This may be because Site 6 is sufficiently east of the regional groundwater depression to not be greatly influenced by the depression.

Aside from 3 ug/l of toluene found in the upgradient well in the first round, the confirmed toluene in downgradient wells in the second and third rounds, the single downgradient detection in the fourth round (probably false positive results), and the 0.12 mg/l TFH-diesel detected in the fourth quarter sample from 6-A-2, no organics were detected in the groundwater. General water quality parameters such as specific conductivity, alkalinity, and bicarbonate were higher at the background well than at the downgradient wells, another indication that they are completed in different geologic units. One exception is that sulfate was detected at 115, 131, 138, and 177 mg/l in four rounds at well 6-A-1. Although these are not particularly high concentrations, it is several times higher than in any other monitoring well on base except 2-R-3. The reason for this is unknown. The California DHS secondary MCL and EPA national ambient water quality criteria for sulfate are 250 mg/l. A primary DHS MCL is not available.

Surface Water

Surface water a Site 6 has the same general characteristics as the surface water sampled at Site 13, located downstream. Water quality parameters were generally measured at lower values than those in groundwater. Toluene was detected in the first three quarterly surface water samples but is probably a false positive result. The absence of confirmed contaminants in the surface water samples except for the single detection of TFH-diesel at 0.070 mg/l in the fourth quarter sample, plus the absence of a migration pathway between the landfill and the creek indicates that Site 6 is not significantly affecting the surface water on base.

4.1.6.3.1 Zones of Contamination

It is concluded that Site 6 may be contributing chlorinated organic compounds, BETX compounds, and TFH-diesel to the soils beneath the landfill, but the concentrations detected and the absence of these compounds in the groundwater sampled indicate that the effects, to date, are minimal in the vicinity of the two downgradient wells. However, there is no monitoring well downgradient of the northern half of the landfill and contaminants could be present there. The apparent zone of organic compound contamination at Site 6 appears to be limited to the upper 30 feet of soil. However, due to the dispersed sample locations in which TFH-diesel was detected and the occurrence in a total depth sample (50 feet vertically), the vertical extent of site related contaminants cannot be established from the information obtained during the Stage 2-1 study.

4.1.6.3.2 Contaminant Migration

Organic compounds are present in the soil beneath Site 6, however, these compounds are not migrating to groundwater in detectable quantities or are not detectable within the area of influence of the two downgradient wells except for the 0.12 mg/l TFH-diesel detected in the fourth round sample from 6-A-2. However, these two wells do not monitor the groundwater downgradient of the north half of the landfill. Another downgradient well will be required to evaluate groundwater contamination downgradient from the north half of the landfill. Considering the relatively low organic compound concentrations in the soil and the extensive clay deposits above the groundwater, the potential for detection of contaminants migrating to groundwater is considered low.

Surface water is located above groundwater levels and, therefore, it is unlikely that the landfill could affect surface water quality. Any infiltrating water will move vertically towards the groundwater.

4.1.6.3.2.1 Potential to Move Off Site and Off Base

Because of the low contaminant migration potential, the potential for contaminants to move from Site 6 off site or off base is very low.

4.1.6.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Any migration of the low concentrations detected in the soil above the groundwater would be downward, towards the groundwater. The rate of migration through the unsaturated zone cannot be accurately predicted based on the information available.

4.1.6.3.2.3 Time of Travel to Receptors

An accurate prediction of the travel time for contaminants in the unsaturated zone to potable water wells downgradient of the base is not possible or appropriate at this time. There were no detected contaminants in the groundwater at Site 6 at the time of sampling except for TFH-diesel in the fourth round. No potable water supply wells are within 1 mile of Site 6.

4.1.6.3.2.4 Applicability of Solute Transport Models

Since almost no contaminants have been detected in the groundwater at Site 6, solute transport models are not applicable.

4.1.6.3.2.5 Expected Spatial and Temporal Variations in Concentration

Concentrations in the soil at Site 6 are expected to vary spatially as a function of location relative to past land-filling activities and temporally as a function of depth. The low concentrations (at or below LOQs) detected at the four angled borings probably do not constitute a significant contaminant source which would be consistently detectable if migration to groundwater occurred.

Groundwater chemistry at Site 6 did not change significantly in the four sampling rounds. The anomalously high sulfate level in well 6-A-1 of 115 mg/l in the first round was similar, but increased slightly (131, 138, and 177 mg/l) in the second, third, and fourth rounds. Water type remained constant for each well.

In surface water, chemical characteristics may vary markedly over successive quarters. TDS changed from 79 to 164 to 250 to 178 mg/l in the four rounds for unknown reasons. COD went from 18.5 to 13.3 to 25.8 to 18.5 mg/l. Nitrate plus nitrate went from 2.2 to 0.42 to 0.49 to 0.53 mg/l.

4.1.6.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part Stage 2-1.

4.1.7 DISCUSSION OF RESULTS FOR SITE 7: ARMY BIOLOGICAL PRODUCTION AREA

As a result of previous investigations conducted at Site 7, AeroVironment concluded that no contaminants were identified. On this basis, it has been determined that no further IRP actions will be taken at this site. A Record of Decision has been prepared for Site 7 and is included in Appendix J of this report.

4.1.8 DISCUSSION OF RESULTS FOR SITE 8: J-57 TEST CELL

During previous investigations conducted at Site 8 (Aero-Vironment, 1987), contamination was identified in soils but not in the groundwater. The Air Force determined that no IRP activities would take place at this site during the Stage 2-1 Remedial Investigation. If it is determined that additional IRP actions are necessary, these actions will be included in future IRP tasks. If it is determined through risk assessment that no further action will be necessary, a Record of Decision will be prepared for the site.

4.1.9 DISCUSSION OF RESULTS FOR SITE 9: ENTOMOLOGY BUILDING 2560

Site 9 is an area adjacent to Building 2560, inside the fenced Civil Engineering Facility. From 1981 to 1987, rinsate and spillage from storing and mixing pesticides and herbicides and cleaning pesticide containers have been discharged onto this gravel area and allowed to evaporate or drain into the soil. Grass does not grow in a small area downhill from the gravel area.

During IRP Phase II, Stage 1 activities in 1986, soils were sampled in the area of the gravel basin. One borehole sample contained chlordane, but the base has stated that this pesticide has not been used on base. A concrete basin and berm designed to eliminate the release of contaminants to the soils has replaced the past practice of draining containers to the ground surface. The basin has a roof over it.

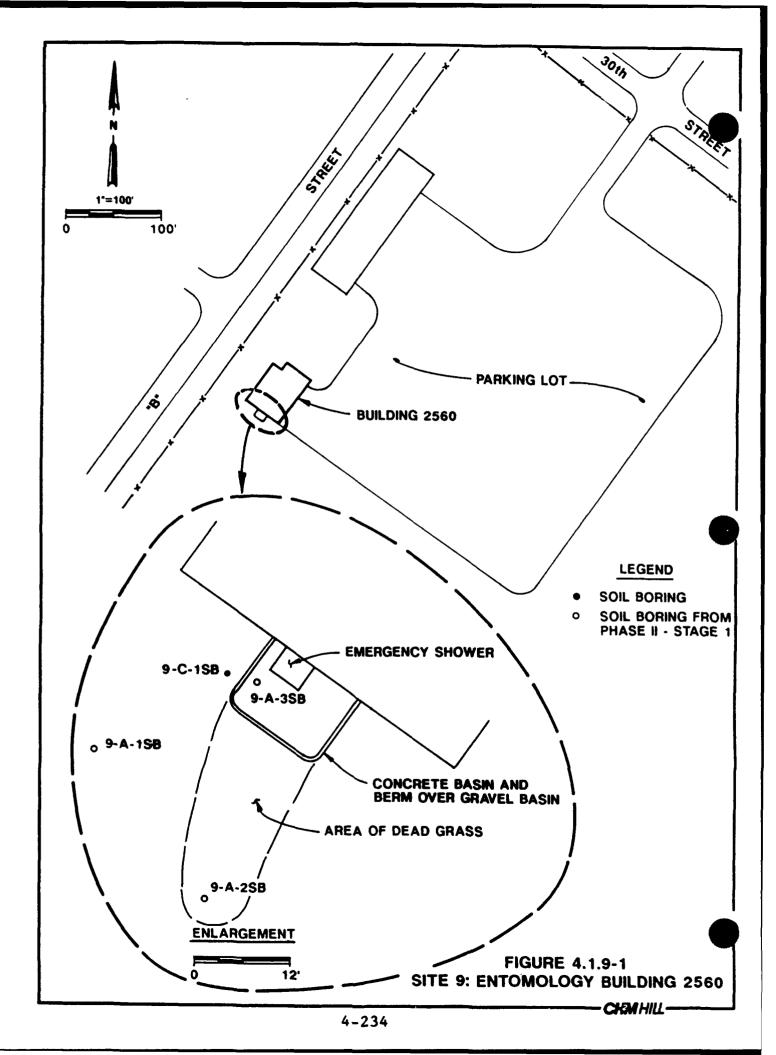
In an attempt to confirm results of the Phase II, Stage 1 study, one soil boring was drilled to a depth of 21.5 feet adjacent to the basin area. The soil encountered included silt and clay above sandy clay. Mercury and TFH-gas were encountered in samples from the boring.

4.1.9.1 Presentation of Results

This section presents the results of the field investigation conducted at Site 9. The discussion focuses on the geology and hydrogeology at the site and presents the results of chemical analyses performed on soil samples.

4.1.9.1.1 Site Geology

Evaluation of the geology at Site 9 is based on a borehole (9-C-1SB) drilled during the current Stage 2-1 investigation and on three boreholes (9-A-1SB, -2SB, and -3SB) drilled during the Phase II, Stage 1 investigation (AeroVironment, 1987). During the Stage 2-1 investigation, one vertical soil boring was drilled at the entomology building to a depth of 21.5 feet. During the Phase II, Stage 1 investigation, three boreholes were drilled to depths of between 8 and 13 feet. The locations of these boreholes are shown in Figure 4.1.9-1. The soil boring log for 9-C-1SB is provided in Appendix D.



The soil boring logs show that near-surface materials at Site 9 may be correlated among the boreholes. Each boring except 9-A-3SB encountered sandy silt at the surface, which continued to a depth of 3 to 5 feet. Borehole 9-A-3SB was drilled in the gravel area next to the building and penetrated fill material at the surface. Each boring then contacted a reddish-brown clay, which extended to a depth of about 13 feet. Borehole 9-C-1SB, which was the only hole to be drilled deeper than 13 feet, penetrated clayey sand from 13 feet to its total depth of 21.5 feet.

Soils at Site 9 constitute an alluvial sequence. At the surface, the deposits at Site 9 have been mapped as belonging to river deposits of Holocene age (Page, 1980). These are sand, silt, gravel, and minor clay deposited along stream channels and their flood plains. These sediments overlie the older Victor Formation deposits in the stratigraphic section at Beale AFB.

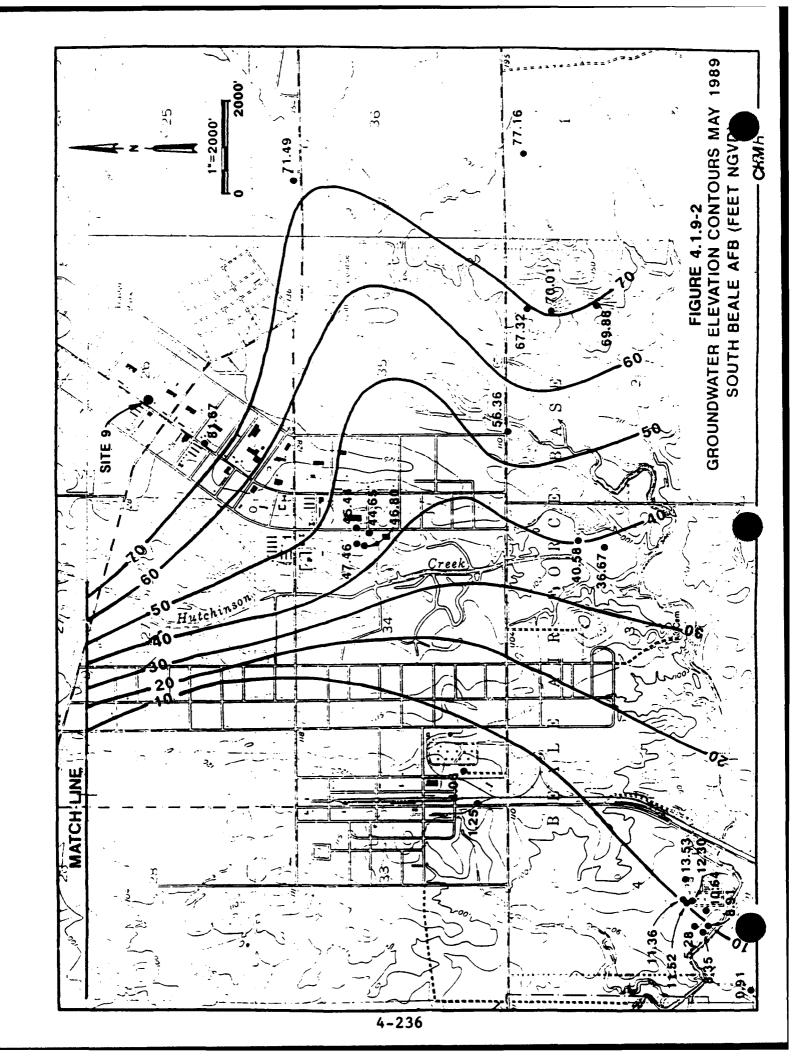
4.1.9.1.2 Site Hydrogeology

No monitoring wells are located at Site 9. Figure 4.1.9-2 shows groundwater elevation contours drawn from groundwater-level data collected from nearby wells in May 1989. Based on these data, groundwater beneath Site 9 is probably flowing toward the southwest.

4.1.9.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections and presentation of analytical results in figures and tables are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.9.1.4 and in Appendix A.

During the IRP Phase II, Stage 1 investigation (AeroVironment, 1987), three soil borings (9-A-1SB, -2SB, -3SB) were drilled at the Entomology Building (Figure 4.1.9-1). The only contamination detected in these borings was from boring 9-A-3SB within the diked pesticide mixing area. A chlordane concentration of 0.9 mg/kg was detected in the zero to 1.5-foot sample and 0.1 mg/kg (below the LOQ) in the 5- to 6.5-foot sample.



In Stage 2-1, five soil boring samples were collected at Site 9 (Figure 4.1.9-1) from one 21.5-foot vertical boring (9-C-1SB) next to the diked area bordering Entomology Building 2560 where pesticides are mixed. These soil boring samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), TFH-diesel and -gas (California method), herbicides (8150) and pesticides and PCBs (8080).

In this investigation toluene was detected in boring 9-C-1SB at the surface (0.043 mg/kg), 5 feet (0.057 mg/kg), 10 feet (0.074 mg/kg), 15 feet (0.019 mg/kg), and 20 feet (0.030 mg/kg). Bis(2-ethylhexyl) phthalate was detected below the LOQ in all samples. ICP metals were similar to typical soils at Beale. Mercury was only detected in the surface sample (0.084 mg/kg). TFH-gas was detected at 5 feet (85 mg/kg), 10 feet (390 mg/kg), and 15 feet (62 mg/kg). No TFH-diesel, herbicides, pesticides, or PCBs were detected in any soil boring samples.

4.1.9.1.4 Analytical Results Table

Table 4.1.9-1 presents a summary of all detected analytes for Site 9. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.9-1 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of Applicable or Relevant and Appropriate Requirements (ARARs) is given in Appendix I.

4.1.9.1.5 Discussion of Analytical Data

The only contaminant detected and not potentially dismissed as false positives at Site 9 was TFH-gas, which was encountered in the soil boring samples from depths of 5 to 6.5 feet, 10 to 11.5 feet, and 15 to 16.5 feet and mercury, which was detected in the zero to 1.5 foot sample. No pesticides or herbicides were detected. Toluene, bis(2 ethylhexyl) phthalate, and di-n-butyl phthalate were detected but probably represent false positive results.

No data corrections have been made based on method blank detections.

TABLE 4.1.9-1

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 9

				Standards, C	Criteria	9-c-158	9-c-158 ^{nR}	9-C-15B	9-C-158 ^{nR}	R 9-C-158	9-C-158 ^{nR}
				and Action L	Levels (a)	BAFB-0204	BAFB-0436	CU2U-84W	5 0.5 5	10 0-11 S	10 0-10 5
Parameter	Method	Limit	Units	Federal	State	12/09/88	01/25/89	12/09/88	01/25/89	12/09/88	01/25/89
Percent Moisture	ASAMO	V/R	×	SR	SN	8.4	Z	12.7	æ	21.4	T.M.
Mercury	27.77	090.0	mo/kg	SE	2	0.084	H	욮	IX	2	-
15E-Gas	TFH-GA	20	7 /kg	SE	SE	욮	H	8	H	380	
Attaine	SW6010	20.0	mo/kg	Ş	SE	7600		0668 8	12	15900	¥
	Su6010	10.0	MQ/kg	SN	10,000	99.5	F8	149	T.N	<u>5</u>	H
Calcium	Su6010	5	mo/kg	SE	SE	2020	Ħ	2500	Ŧ	250	Ħ
Chronium	S46010	3.0	MO/kg	SI	200	20.0	H	 	H	38.9	F
Cobalt	SW6010	6.0	mo/ko	SE	8.000	5.7	H	43.3	H	24.2	=
Cooper	S46010	3.0	æ/kg	S	2,500	41.0	H	55.0	H	59.5	=
1500	St46010	10.0	mo/kg	SE	SE	10300	E	30800	H	27400	
Magnetian	S46010	5	mo/ko	SZ	S	2760		0887	H	98 70	Ħ
Mandanese	S146010	1.5	mo/ko	SE	SE	254	H	1580	H	84	-
Mickel	SW6010	0.4	mo/kg	SE	2,000	17.9	H	22.9	H	24.2	Ħ
Potassius	SW6010	90 200 200	ao/ka	S	SE	693	I	355	H	1.27	Ξ
Sodie	SW6010	5	Mo/kg	SH	SE	122		132	X	5 000	Ħ
Vanadius	SW6010	4.0	mo/kg	SR	2,400	23.5	Ħ	<u>\$</u>	Ħ	6.87	H
Zinc	SW6010	2.0	mo/ka	SE	2,000	53.2	TW.	63.3	M	9.92	Ħ
Anatona	SW240	0.010	ao/ka	SE	SZ	0.013		0.031	H	0.034	Ħ
Tolivene	SM6240	0.005	mo/ko	S#	SE	0.043	Ħ	0.057	H	0.074	=
Phenol	SW8270	0.33	mg/kg	SE	SH	2.7	TX 8	3.0	B NT	2.8	E NI
Di-n-butylchthalate	SW8270	0.33	ma/kg	SZ	SZ	2		2	1	0.074	
bis(2-ethylhexyl)phthalate	Su6270	0.33	10/kg	S	SE	0.22	T# -	0.11	T .	0.24	- F
									! ! !	: : : : : : :	

e: equipment wash blank f: field replicate R: resample (): values listed in () are 2nd column confirmation values. n: analyses performed to detect herbicides, no analytes detected a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate. 8: analyte detected in blank
J: estimated value, below quantification limit f: field repl
b: field blank (ambient condition blank)
R: resample
n: analyses performed to detect herbicides, no analytes detected ND: analyte not detected. NS: No standard criteria or action level currently exists. NOTES: Results reported for detected analytes only. MT: analyte not tested

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.9-1 (continued)

				Standards, Criteria	Criteria	9-c-158 ^{ta}	* 9-c-1SB	9-c-158 ^{nr}	9-c-1SB	9-c-158 ^{ak}
				and Action	Levels (a)	BAFB-0439	BAFB-0207	BAFB-0440	BAFB-0211	BAFB-0441
	Merhod	Detection Limit	lbite.	Factoral	State	10.5-11.0' 15.0-16.5'	12,0-16.5	15.0-15.5	20.0-21.5	20.0-20.5
					:	******				20/22/22
Percent Moisture	ASAMO	4/ N	*	SN	SR	H	19.4	IN	23.1	Ħ
TFH-Gas	TFH-GA	20	mg/kg	SE	SE	H	3	H	⊋	H
Aluminum	Stu6 010	20.0	MO/kg	SE	SH	H	10100	H	13300	Ħ
Barium	\$16 010	10.0	mo/kg	SE	10,000	H	61.8	H	5 87	H
Calcium	SW6010	5	Mo/kg	SE	SE	H	3150	H	7920	Ħ
Chromium	Stu6010	0, N	mo/kg	SE	200	×	23.6	H	35.9	Ξ
Cobalt	Su6010	4.0	mo/kg	SR	8,000	LN	11.5	H	29.8	E
Copper	SW6010	3.0	mo/kg	SH	2,500	H	36.2	Ħ	57.1	¥
I con	Su6010	10.0	Mo/kg	SH	SH	H	24100	Ħ	30200	Ħ
Magnesium	Su6010	5	mo/kg	SE	SE	Ħ	0687	H	7610	¥
Manganese	Su6010	1.5	mo/kg	Si	SZ	H	329	H	1340	Ħ
Hickel	Su6010	4.0	mo/kg	SI	2,000	TN	13.6	H	23.4	Ħ
Potassium	Su6010	8	mg/kg	SH	SN	H	372	H	3 8	Ħ
Sodium	SW6010	5	MQ/kg	SN	N	H	118	H	174	H
Vanadium	Su6010	6.0	MO/kg	SI	2,400	Ħ	66.5	Ħ	9.08	=
Zinc	Su6010	2.0	mg/kg	SH	2,000	Ħ	6.09 6.09	H	75.3	H
Acetone	SM6240	0.010	MG/kg	S¥	ST		0.037	Ħ	2	¥
2-Butanone	SM8240	0.010	RO /kg	SR	SZ	H	900.0	- H	2	H
Toluene	SM8240	0.002	MQ/kg	SX	SH	Ħ	0.019	H	0.030	Ħ
Phenol	Su8270	0.33	MG/kg	SR	SE	Ħ	2.5	- X	5.6	E
Di-n-butylphthelete	S146270	0.33	MO/kg	SZ	SE	¥	0.14	- X	0.14	- H
bis(2-ethylhexyl)ohthalate	Su8270	0.33	MO/kg	SI	SE	×	0.16	L IN	0.20	- H

WI: analyte not tested
WD: analyte not detected.
WD: Wo standard in () are 2nd column confirmation values.
WD: Values represent most stringent standard, criteria or action level. See Appendix I.
WD: The federal standard for Witrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l NOTES: Results reported for detected analytes only.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

for Mitrate + Mitrite given as Mitrate.

Except for false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling.

- 4.1.9.2 Sampling and Analytical Problems
- 4.1.9.2.1 Loss of Samples

There were no sample loss problems for Site 9 samples. All five soil boring samples were resampled for herbicide analysis (8150) due to holding time violations.

All scheduled analyses were completed.

4.1.9.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 9 contained several organic compounds that were probably laboratory- or field-induced false positive results. Four of the five soil samples collected contained acetone. This is a common laboratory contaminant and, although not detected in the method blank, probably represents a false positive result.

Several soil samples contained the semivolatile compounds bis(2-ethylhexyl) phthalate and di-n-butyl phthalate. The phthalate compounds were commonly detected in samples and blanks from throughout the base and are probably false positive results.

Phenol was detected in all soil samples at concentrations ranging from 2.5 mg/kg to 3.0 mg/kg. This has been traced to a factory contaminated bottle of acetone used in the extraction process. The concentration of phenol in the affected samples was estimated to be 1.7 mg/kg based on laboratory blank analysis. The detected phenol concentrations are above this estimate, but within an associated range of uncertainty, and are believed to represent false positives.

Toluene was detected in all of the soil samples at low concentrations. This occurred for samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent and non-reproducibility in replicate samples taken at various sites suggest that it is a false positive result. For other sites on the base where soil replicate QC samples were taken, duplication of the toluene result was not good. This is indication that the toluene is probably not a true contaminant.

No soil replicate QC samples were collected at Site 9.

4.1.9.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 9 samples.

4.1.9.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.9.3 Significance of Findings

No pesticides or herbicides were detected in any of the soil samples in Stage 2-1. Mercury, not detected in background soil samples on the base, was detected in the surface sample at a concentration of 0.084 mg/kg. The mercury may be from pesticides mixed near the area. The DHS TTLC for mercury is 20 mg/kg.

TFH-gas were detected in samples from 5, 10, and 15 feet at concentrations from 62 to 390 mg/kg. The source of these organics at this facility is unknown.

In the Phase II, Stage 1 study, soil within the gravel area had detected concentrations of chlordane less than 1 mg/kg in two samples in one boring. The DHS TTLC for chlordane is 2.5 mg/kg. Stage 2-1 studies did not detect chlordane in the one boring outside the gravel area.

4.1.9.3.1 Zones of Contamination

Soil between 5 and 15 feet BGS is contaminated with TFH-gas. The extent of this contamination is apparently limited to this depth interval at this location since it was not detected above or below. The lateral extent is not known, but the small scale and infrequent mixing operations at this site make widespread contamination of TFH-gas doubtful.

4.1.9.3.2 Contaminant Migration

Contamination is not expected to migrate from Site 9.

4.1.9.3.2.1 Potential to Move Off Site and Off Base

The potential for contamination to move off the site or off the base is very low. 4.1.9.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Contamination probably has not affected groundwater at Site 9, based on contaminant concentrations in 9-C-1SB.

4.1.9.3.2.3 Time of Travel to Receptors

Other than base personnel performing pest control, there are no obvious potential human receptors.

4.1.9.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 9 because no groundwater studies were conducted at this site and contaminants probably have not reached groundwater.

4.1.9.3.2.5 Expected Spatial and Temporal Variations in Concentration

Spatial and temporal variations, if any, are not apparent from the sampling which has been conducted to date.

4.1.9.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.10 DISCUSSION OF RESULTS FOR SITE 10: J-58 TEST CELL

During previous investigations conducted at Site 10 (Aero-Vironment, 1987), contamination was identified in soils but not in the groundwater. The Air Force determined that no IRP activities would take place at this site during the Stage 2-1 Remedial Investigation. If it is determined that additional IRP actions are necessary, these actions will be included in future IRP tasks. If it is determined that no further action will be necessary, a Record of Decision will be prepared for the site.

4.1.11 DISCUSSION OF RESULTS FOR SITE 11: AIRCRAFT GROUND EQUIPMENT MAINTENANCE AREA

For the past 25 years, aircraft ground support vehicles have been operated from a paved area adjacent to the Aircraft Ground Equipment (AGE) maintenance shop at Building 1225. These vehicles have been known to leak oil and hydraulic fluids. Maintenance activities may have included using solvents or degreasers. A drainage ditch behind Building 1225 has shown evidence of staining, likely from fuel- and oil-contaminated runoff. Some of the stained soils were removed in 1984, but some discoloration is still visible.

In the Phase II, Stage 1 study, one monitoring well was installed and four soil borings and seven soil hand auger locations were sampled and analyzed. During the Stage 2-1 study, three borings were drilled near the edge of the pavement. The existing well was sampled semiannually for a year.

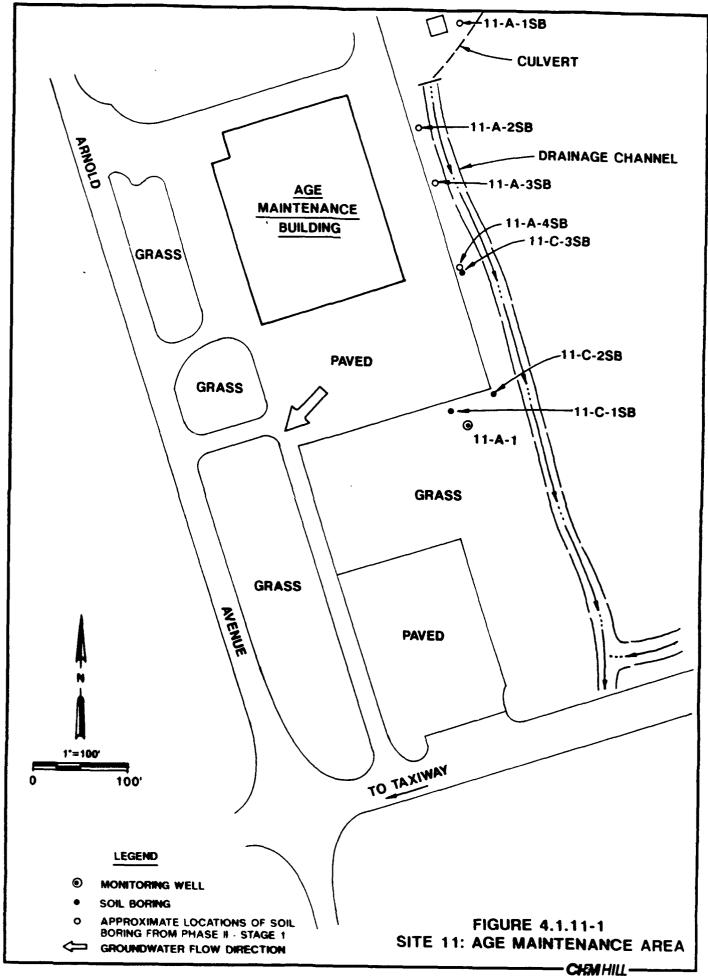
4.1.11.1 Presentation of Results

This section presents the results of the field investigation conducted at Site II. The discussion focuses on the geology and hydrogeology at the site and presents the results of chemical analyses performed on soil and groundwater samples.

4.1.11.1.1 Site Geology

Evaluation of the geology and hydrogeology at Site 11 is based on three shallow boreholes drilled during the current Stage 2-1 investigation and on a monitoring well drilled during the Phase II, Stage 1 investigation (AeroVironment, 1987). During the Stage 2-1 investigation, three vertical soil borings that ranged in depth from 8 to 12 feet were drilled at the AGE maintenance area. During the Phase II, Stage 1 investigation a monitoring well was drilled to a depth of 140 feet and screened across the water table. The locations of the boreholes and monitoring well are shown in Figure 4.1.11-1. Soil boring logs are provided in Appendix D.

The soil boring logs show that near-surface materials at Site 11 consist of fine-grained silts and clays. However, at a depth of about 8 feet in boreholes 11-C-1SB and 11-C-2SB and at a depth of about 9 feet in borehole 11-C-3SB and well 11-A-1, the drill bit entered a gravel and sand unit with cobbles. In the Phase II, Stage 1 investigation, this gravel zone was encountered from 10.5 to 12.5 feet in boring 11-A-4SB, from 11.5 to 13 feet in 11-A-3SB, and was



not encountered in the 16.5-foot boring 11-A-2SB (Aero-Vironment, 1987). According to the well borehole log, the sands continued for the entire length of the hole, varying between silty sand and sand with gravel (AeroVironment, 1987). This thick sequence of sands was also found in other boreholes in the flightline area, Sites 1, 3, 4, 5, and 21.

Surface soils at Site 11 have been mapped as belonging to the Laguna Formation (Page, 1980). This formation is of Pleistocene and Pliocene age and consists of an alluvial sequence of silt, sand, clay, and unsorted gravel. The Laguna Formation overlies the volcanic rocks from the Sierra Nevada in the stratigraphic section at Beale AFB. Although this unit outcrops about 1 mile west of Site 11, the log of well 11-A-1 gave no indication of contacting volcanic materials.

4.1.11.1.2 Site Hydrogeology

The first saturated permeable zone in well 11-A-1 that produced water during drilling occurred at a depth of about 130 feet BGS (-6 feet NGVD) in gravel and pebbles with coarse sand. After completion of the well, the depth to water remained at about 130 feet BGS (-6 feet NGVD). The vadose zone above the aquifer is composed of sand units nearly to the ground surface, as described above. Therefore the aquifer is unconfined at Site 11. No impermeable basal unit was contacted in the borehole through its total depth of 140 feet.

Groundwater levels in well 11-A-1 between April 1986 and November 1989 are summarized in Table 4.1.11-1 and in Figure 4.1.11-2. This table shows that the groundwater level in this well has risen over 13 feet during this period. This rise is part of a regional water level rise comparable to that observed in other shallow monitoring wells in the vicinity (e.g., wells at Sites 3, 4, and 5) and is presumably due to a reduction in the regional groundwater depression centered to the west of the base. The water level rose about 3.6 feet between December 1988 and November 1989 and showed no seasonal fluctuations.

		GROU		ole 4.1.1 ELEVATIO	1-1 NS: SITE	11		
<u>Well</u> 11-A-1	Screened Interval 8 to -12	<u>1986</u>	<u> 1986</u>	<u> 1988</u>		May 1989 7.58	 Nov. 1989 9.40	



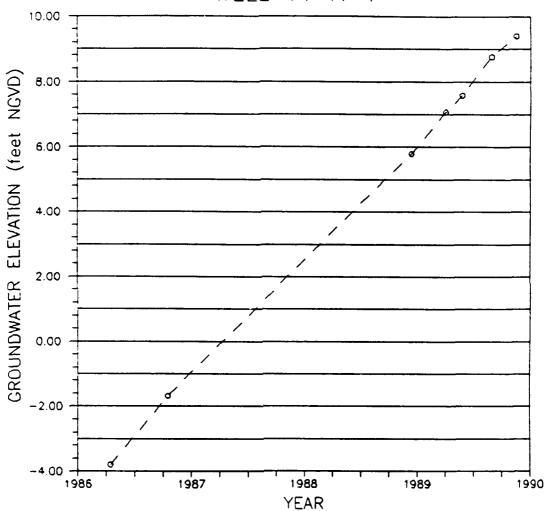


FIGURE 4.1.11-2

MONITORING WELL HYDROGRAPH
SITE 11: AGE MAINTENANCE AREA

Contours of groundwater levels taken in May 1989 from monitoring wells screened across the water table in the flightline area of Beale AFB are plotted in Figure 4.1.11-3. Groundwater levels taken across Beale AFB in March and November 1989 are plotted in Plates 3 and 4. Groundwater contours drawn on these levels show that groundwater flows toward the southwest in the vicinity of Site 11. The gradient increases to the east of well 11-A-1, from about 0.002 to about 0.02. This change may be due to a change in hydrogeologic regimes from unconsolidated sediments of the Central Valley to consolidated rocks of the foothills of the Sierra Nevada. Aquifer parameters in the immediate vicinity of Site 11 are unknown because no tests were performed on existing well 11-A-1 during the Stage 2-1 investigation.

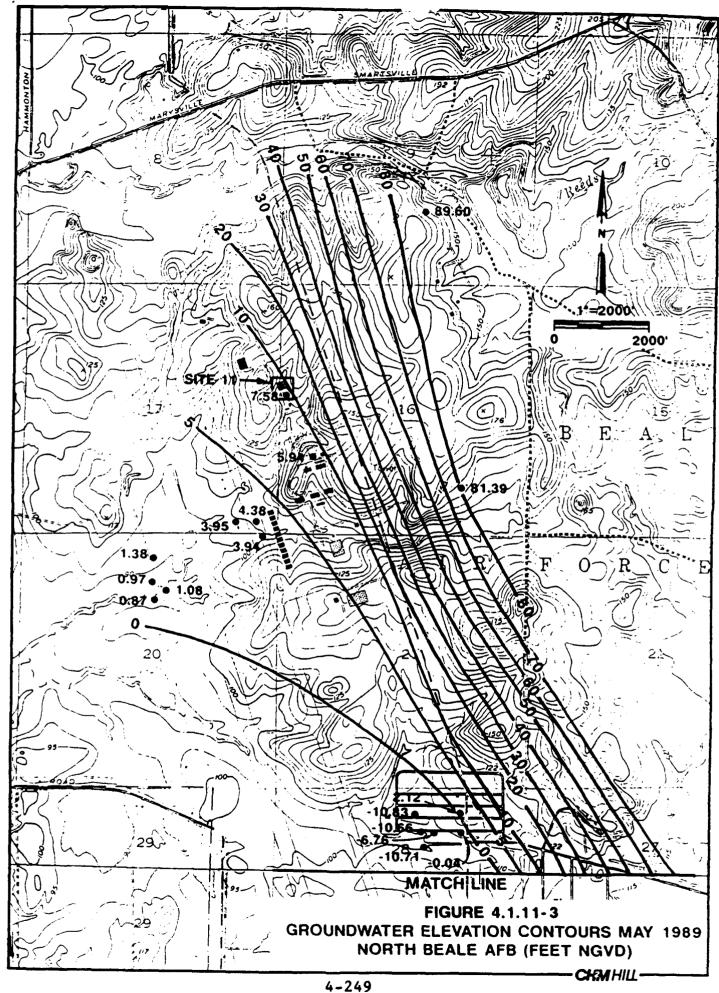
4.1.11.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.11.1.4. and in Appendix A.

Soil

Six soil boring samples were collected at Site 11 (Figure 4.1.11-1) from three shallow soil borings. These borings were planned to be drilled to a 10-foot depth, but the auger rigs were unable to sample at 10 feet due to a gravel layer. These soil boring samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method).

During the IRP Phase II, Stage 1 investigation (AeroVironment, 1987), three soil borings 11-A-2SB, -3SB, and -4SB were drilled along the edge of the pavement parallel to and northeast of the AGE maintenance building (Figure 4.1.11-1). Oil and grease were detected in the surface soil samples at 7,000, 3,900, and 1,500 mg/kg, going from a northwest to a southeast direction. No contamination was detected in the 6-foot samples.



During the current investigation, toluene was detected in the soil boring samples at 0.017 to 0.14 mg/kg. 2-butanone was detected in the 6-foot sample at boring 11-C-2SB at 0.095 mg/kg and tentatively detected below the LOQ in two other samples. TCE was detected in the surface sample at boring 11-C-3SB at 0.014 mg/kg and carbon disulfide at 0.006 mg/kg (the LOQ).

Bis(2-ethylhexyl) phthalate was detected at 0.65 mg/kg in the surface sample at boring 11-C-3SB. Bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and n-nitrosodiphenylamine were detected in several samples below the LOQ. Lead was detected at 119 mg/kg and cadmium at 4.7 mg/kg in the surface sample at boring 11-C-3SB. Barium was detected at 1,040 mg/kg in the 5- to 6.5-foot sample in 11-C-1SB and 445 mg/kg in the surface field replicate sample 11-C-3SB. Beryllium was detected at 0.78 mg/kg in the 6- to 7.5-foot sample in 11-C-2SB and 0.85 mg/kg in the 1.5- to 3.0-foot sample in 11-C-3SB. Other metals were at levels similar to background soil values at Beale AFB. TFH-gas was detected at 32 mg/kg in the surface sample in boring 11-C-2SB. TFH-diesel was detected at 84 mg/kg in the surface sample in boring 11-C-3SB.

Groundwater

During the Phase II, Stage 1 investigation of groundwater (AeroVironment, 1987), TCE was detected in well 11-A-1 at 0.4 ug/l in the April 1986, sampling rounds and was not detected in the October 1986, sampling round.

Through the two semiannual rounds of water sampling at Site 11 (April and August 1989), two groundwater and one field replicate samples were collected from monitoring well 11-A-1. Analyses performed for the groundwater samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), water quality parameters, (various methods) and TFH-diesel and -gas (California method).

During the first semiannual sampling round of this investigation, toluene was detected at 1 ug/l (2 ug/l in second column) in the groundwater sample from well 11-A-1. Purgeable halocarbons, TFH-diesel, and TFH-gas were not detected in groundwater at Site 11 and TDS were 167 mg/l. Major anions and cation concentrations at this well are generally similar to other sites near the flightline. Nitrite plus nitrate (expressed as nitrate) was 8.1 mg/l. Sulfate was lower than at most sites at Beale at 6.8 mg/l.

During the second semiannual sampling round, purgeable halocarbons, purgeable aromatics, TFH-diesel and -gas were not detected in groundwater sampled at Site 11. TDS were 242 mg/l in the sample and 203 mg/l in the field replicate. Major anions and cations were again generally similar to other wells in the flightline area. Iron was detected at 0.128 mg/l in the original sample and was not detected in the field replicate. Groundwater at Site 11 is a sodium bicarbonate type.

4.1.11.1.4 Analytical Results Table

Table 4.1.11-2 presents a summary of all detected analytes for Site 11. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.11-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.11.1.5 Discussion of Analytical Data

With the exception of probable false positive results, contaminants in the form of TCE and lead were detected in only one sample at Site 11. TFH-diesel and -gas were detected in one separate sample each. Contaminants were not detected in the groundwater. Table 4.1.11-3 presents the range of contaminants encountered for each of the media sampled (soil borings and groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. These detections may represent laboratory "noise," and some of the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study the LOQ is

TABLE 4.1.11-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 11

				Standards, Criteria	11-C-15B	11-C-1SB	11-C-258	11-C-258	11-C-388	11-C-358R
				Levels	(a) BAFB-0212	BAFB-0213	BAFB-0280	BAFB-0281	BAFB-0406	BAFB-0541
		Detection				5.0-6.5	0.0-1.5	6.0-7.5	0.0-1.5	0.0-1.5
Parameter	Method		Units	Federal State	-	12/09/88	12/16/88	12/16/88	01/13/89	05/03/89
Percent Moisture	ASAMP	K/N	><	**************************************	s 10.9	17.6	15.9	23.5	16.9	=
TFH-Diesel	TFM-DI	1.0	ma/kg	MS SM	Q#	9	2	2	2	Ħ
TFH-Gas	TFH-GA	20	mg/kg	NS SN	S	2	35	2	욡	Ħ
Alumina	Su6010	20.0	ma/kg	NS NS	S 8930	1700	10700	29000	7560	Ħ
Berica	Stu6 010	10.0	mg/kg	NS 10,000	134	1040	118	371	241	H
Beryllium	SW6010	0.50	MQ/kg	NS SN	<u>용</u>	윺	2	0.78	9	Ħ
Cadaium	Sta6010	1.0	mg/kg	NS 10	₽	욮	2	2	4.7	Ħ
Calcium	Su6010	5	Mo/kg	Z SZ	2040	4250	2680	0697	2740	Ħ
Chromium	Sta6010	3.0	MQ/kg	NS 200	_	32.0	22.6	30.3	30.8	H
Cobalt	Su6010	4.0	MQ/kg	MS 8,00		10.9	8.3	13.1	7.8	Ħ
Copper	SW6010	3.0	mg/kg	NS 2,500	97.5	42.4	15.5	27.8	42.4	H
Iron	Stat6010	10.0	MQ/kg	SN SN		28200	18100	26500	14400	H
read	Su6010	20.0	BA/BH	NS 1,000		2	윺	욮	119	H
Regnesium	SW6010	5	MQ/kg	N SN		4380	2320	3220	564 0	¥
Hangahese	Su6010	1.5	MQ/kg	SN SN		351	219	612	<u>\$</u>	×
Nickel	Su6010	4.0	mg/kg	NS 2,000		24.5	8.8	24.8	13.2	H
Potassium	Su6010	90 2	86/kg	SE SE		643	2	£	9	Ħ
Sodium	Su6010	5	mg/kg	¥ 52		483	&	787	9 2 2	H
Vanadius	Stu6010	0.4	Mg/kg	NS 2,40	50.3	71.2	57.0	77.8	6.74	H
Zinc	Stu6010	2.0	mg/kg	NS 5,000		82.9	28.8	40.0	89.0	H
Methylene Chloride	SMB240	0.005	mg/kg	Z SX		유	웆	2	0.053	H
Acetone	SW6240	0.010	mg/kg	NS SN	\$ 0.036	0.025	0.008	0.025	0.053	H
Carbon Disulfide	SMB240	0.005	mg/kg	N SN	2	윺	2	9	0.006	H
2-Butanone	SW8240	0.010	mg/kg	SE	9	윺	욮	0.095	0.012	- H
Trichloroethene	SM8240	0.002	mg/kg	NS 2,040		윺	웆	2	0.014	Ħ
Toluene	SM8240	0.002	MQ/kg	SZ SZ	S 0.047	0.030	0.056	0.063	0.14	=
4-Nitrosodimethy(amine	Su6270	0.33	mg/kg	XS SX	SE SE	Q	Ş	æ	LN L	0.063
Phenol	SH8270	0.33	mg/kg	X SX	2.1	8 2.3 8	¥	2	Ħ	웆
N-nitrosodiphenylamine	Su6270	0.33	mg/kg	X SX	0.048	유 구	2	¥	H	윺
Di-n-butylphthalate	SUB270	0.33	mg/kg	Z SZ	0.081	BJ 1.0 B	2	0.18	H	2
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	SH	s 0.22	81 0.33 B	J 0.087	8J 0.16	BJ NT	0.65
MOTER. Besuits reported for detected and	detected	analytes only	×							
MT: analyte not tested				B: analyte detected	etected in blank	¥		e: equir	equipment wash blank	ol ank
MD: analyte not detected.				J: estimated value	value, below	below quantification limit	on limit	f: field	field replicate	<u>;</u>

MD: analyte not detected.
 MD: analyte not detected.
 MS: No standard criteria or action level currently exists.
 D: field blank (ambient condition blank)
 R: resample
 N- values represent most stringent standard, criteria or action level. See Appendix I.
 The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + .Mitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.11-2 (continued)

Parameter Method Limit Units Percent Moisture ASAMP N/A X Atuminum SAM6010 20.0 mg/kg Berytlium SAM6010 10.0 mg/kg Calcium SAM6010 10.0 mg/kg Chromium SAM6010 3.0 mg/kg Copalt SAM6010 4.0 mg/kg Copper SAM6010 10.0 mg/kg Mangaresium SAM6010 1.5 mg/kg Potassium SAM6010 4.0 mg/kg Sodium SAM6010 4.0 mg/kg	* * * * * * * * * * * * * * * * * * *	Federal State NS N	1.5-3.0 01/13/89 01/13/89 17.7 11200 445 0.85 3320 19.4 8.3 18.2	BAFB-0542 1.5-3.0 05/03/89 NI NI NI NI NI NI NI N	5.0-6.5' 01/13/89 01/13/89 15000 312 0.65 4020 19.4 11.0 25.9	BAFB-0543 5.0-6.5 05/03/89 NT NT NT NT NT NT NT NT
Detection Method Limit Un Saddolo 20.0 Saddolo 10.0 Saddolo 10.0 Saddolo 3.0 Saddolo 4.0 Saddolo 10.0 Saddolo 10.5 Saddolo 10.0 Saddolo 10.0 Saddolo 10.5 Saddolo 10.0 Saddolo 10.5 Saddolo 10.0 Saddolo 10.5 Saddolo 10.0 Saddolo 10.5 Saddolo 10.0 Saddolo 10.0			•	1.5-3.0' 05/03/89 NT NT NT NT NT NT NT NT	5.0-6.5' 01/13/89 15000 312 0.65 4020 19.4 11.0 25.9	5.0-6.5- 05/03/89 27 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28
Method Limit Un saddon 20.0 saddon 20.0 saddon 10.0 sa			1	05/03/89 NI	22.8 15000 312 0.65 4020 19.4 11.0 25.9	05/03/89 NT
Subolo 10.0	6/kg 6/kg 6/kg 6/kg 6/kg 6/kg 6/kg 6/kg	2,500 2,500 2,500 2,500 2,500	17.7 11200 445 0.85 3320 19.4 18.2 17600		22.8 15000 312 0.65 4020 19.4 11.0 25.9	**************************************
\$46010 20.0 \$46010 10.0 \$46010 0.50 \$46010 3.0 \$46010 3.0 \$46010 10.0 \$46010 10.0 \$46010 10.0 \$46010 1.5 \$46010 1.5	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	25 000 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	11200 445 0.85 3320 19.4 8.3 18.2 17600		15000 312 0.65 4020 11.0 25.9	44444
\$46010 10.0 \$46010 0.50 \$46010 100 \$46010 3.0 \$46010 4.0 \$46010 10.0 \$46010 10.0 \$46010 1.5 \$46010 1.5 \$46010 1.5	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	10,000 8 8 8 8 8 75 75 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	445 0.85 3320 19.4 17600		312 0.65 4020 19.4 11.0 25.9	
Su6010 0.50 Su6010 100 Su6010 3.0 Su6010 4.0 Su6010 10.0 Su6010 10.0 Su6010 1.5 Su6010 1.5 Su6010 1.5 Su6010 1.0	70 kg	25 S S S S S S S S S S S S S S S S S S S	0.85 3320 19.4 18.2 1760	52222	0.65 4020 19.4 11.0 25.9	
Su6010 100 Su6010 3.0 Su6010 4.0 Su6010 10.0 Su6010 10.0 Su6010 1.5 Su6010 1.5 Su6010 4.0 Su6010 200	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3320 19.4 8.3 18.2 1760		4020 19.4 11.0 25.9 26800	
Su6010 3.0 Su6010 4.0 Su6010 10.0 Su6010 10.0 Su6010 1.5 Su6010 1.5 Su6010 4.0 Su6010 100	2222 2422 2426	NS 2,500	19.4 8.3 18.2 17600	5555	19.4 11.0 25.9 26800	
SM6010 4.0 SM6010 3.0 SM6010 10.0 SM6010 1.5 SM6010 1.5 SM6010 4.0 SM6010 200 SM6010 100	% & & & & & & & & & & & & & & & & & & &	NS 2,500	8.3 18.2 17600		11.0 25.9 26800	N N N
SM6010 3.0 SM6010 10.0 SM6010 10.0 SM6010 1.5 SM6010 4.0 SM6010 200	#0/kg #0/kg #0/kg	NS 2,500	18.2 17600 2003	E E	25.9	
Su6010 10.0 Su6010 100 Su6010 1.5 Su6010 4.0 Su6010 200 Su6010 100	20/kg 70/kg	SN	17600 0003	H	26800	L¥
Su6010 100 Su6010 1.5 Su6010 4.0 Su6010 200 Su6010 100	mg/kg	47	7000			
Su6010 1.5 Su6010 4.0 Su6010 200 Su6010 100			3	TM	3960	
SN6010 4.0 su6010 200 su6010 100 su6010 100 su6010 100 su6010 su6010 100 su6010	1 0/kg	SN SN	Ĕ	×	2	H
S46010 200 a S46010 100 a	mg/kg	MS 2,000	14.6	Ħ	16.8	Ħ
SW6010 100 n	mg/kg	SM	2	H	583	Ħ
	mg/kg	SN SN	433	Ħ	539	H
Su6010 50.0	Mo/kg	MS 700	3	H	110	F.
Su6010 4.0	10 /kg	NS 2,400	63.5	H	83.3	X
S46010 2.0 m	MQ/kg	NS 5,000	32.9	H	50.6	H
0.002	MO/kg	SN SN	0.050 8	H	0.009 B	×
Su6240 0.010 m	MQ/kg	SE	0.35 8	Ħ	0.035 8	Ħ
0.002	Mg/kg	SN SN	0.007 8	TM	Ę	LN.
one SuB240 0.010 m	Mg/kg	SE	0.027 8	H	0.012 J	1
SM8240 0.005	m 0/kg	SN NS	0.017	H	0.065	H
SuB270 0.33 m	mg/kg	SN	Ħ	0.077	Ħ	0.093
0.33	mg/kg	SN	H	0.14 3	Ħ	2

MOTES: Reaults reported for detected analytes only.

MT: analyte not tested

MD: analyte not tested

MD: analyte not tested

MD: analyte not detected.

MD: analyte not detected in blank

MD: analyte not detected.

MD: analyte detected in blank

MD: analyte not detected in limits.

MD: analyte detected in blank

MD: detection limits are for delucion = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.11-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 11

				Standards, Criteria and Action Levels (a)	Criteria evels (a)	11-A-1GW	
		Detection	_			8AFB-0526	
Parameter	Method	Limit	Units	Federal	State	04/04/89	
Continue Contractivity	E120.1	1.0	Carrios/Car	SN NS	8	200	
Tomorphica	F170.1	* /*	O Comp	S	SE	22.0	
	E150.1	*	7	5-9	SE	3.2	
Alkalinity - Total	204603	1.0	1 / 0	2	SE	6 .0	
Bicarbonate	20403	0.1	70	SZ.	SX	102.5	
Total Dissolved Solids	E160.1	3.0	Ž	200	200	167	
Chloride	E325.3	1.0	7	250	220	11.4	
Fluoride	E340.2	0.050	7	~	1.4	0.37	
Eithe + Mithits	£353.3	0.050	/0	•	45	8.1	
Sulfate	E375.4	1.0	//	250	250	6.8	
	SU6010	1.00	1/02	SZ	SE	11.1	
Macrostian	SU6010	1.00	1/04	NS	SN	4.28	
Potentia	SUK010	1.00	/	SE	SE	1.00	
Sodil	Succord	1.00	7	SH	SE	27.9	
Toluene	84B020	-	3	14,300	\$	1(2)	
MOTES. Beside at Language	for detected	anelytes only	s) k			, ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	
MI. soulche not tested	5	•		-	nalyte dete	B: analyte detected in blank	e: equipment wash blank

MS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l f: field replicate R: resample B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NT: analyte not tested ND: analyte not detected.

for Mitrate + Mitrite given as Mitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.11-2

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 11

				Standards, C	riteria				•	
				and Action L	Levels (a)	11-A-1GV	11-A-16W	11-A-1GV	11-A-1GU	
		Detection	,			BAFB-0620	BAFB-0621		BAFB-0618	
Parameter	Method	Limit	Units	Federal	State	08/31/89	08/31/89	08/31/89	08/31/89	
Specific Conductivity	E120.1	1.0	Callos/Ca	SE	8	002	:	=		• 6 2 5 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Temperature	E170.1	W/W	0 0 0	SI	SH	22.0		F	H	
***************************************	£150.1	W/W	Ŧ	8-9	SH	7.83		H	Ħ	
Alkalinity - Total	\$94603	1.0	7	20	SH	74.0		7	Ħ	
Bicarbonate	S#403	0.	Ž	SN	SŦ	80.3		I	¥	
Total Dissolved Solids	E160.1	3.0	-/ Q	200	200	242		22.0	H	
Chloride	E325.3	0.	Ž	220	220	12.2		9	Ħ	
Fluoride	E340.2	0.050	1	8	1.4	0.25		2	13	
Mitrate + Mitrite	£353.3	0.020	7	•0	45	10.1		1.2	H	
Sulfate	E375.4	1.0	7	220	220	21.1		9	H	
Calcida	Sw6010	8	7	SH	SN	12.2		2	1	
Lien	SW6010	0.100	7	ĸ.	m;	0.128		2	=	
Magnestus	Su6010	8	1	SE	SE	4.70		2		
Sodium	SU6010	9.	7	SW	S#	27.3		웆		
Methylene chloride	S46010	ın	3	SE	SN	2		730(1200)	80	
Toluene	SUB020	-	7	14,300	5	2	9	2	13	
M-Witrosodiphenylamine (1)	SW6270	2	7/05	SN	SH	~ ~	.	3. 5.	2	
bis(2-Ethylhexyl)Phthelete	Su6270	5	700	ST	SH	₽		3		
						* • • • • • • • • • • • • • • • • • • •				

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level selected blank (ambient condition blank)

MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

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MS: No standard in () are 2nd column confirmation values.

MS: No standard in () are 2nd column confirmation values.

MS: No standard condition limit for a 2nd column confirmation values.

MS: No standard confirmation limit for a 2nd column confirmation values.

MS: No standard confirmation limit for a 2nd column confirmation values.

MS: No standard confirmation limit for a 2nd column confirmation values.

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MS: No standard confirmation limit for a 2nd column confirmation values.

MS: No standard confirmation limit for a 2nd column confirmation values.

MS: No standard confirmation limit for a 2nd column confirmation values.

MS: No standard confir

e: equipment wash blank f: field replicate R: resample

for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Table 4.1.11-3
RANGES OF CONTAMINANTS DETECTED AT SITE 11

CONTAMINANT		MINIMUM	MAXIMUM	# DETECTIONS/
ANALYTE	UNITS	CONC.	CONC.	# SAMPLES
SOIL BORINGS				
TFH-diesel	mg/kg	NO	84	1/6
TFH-gas	mg/kg	ND	32	1/6
lead	mg/kg	ND	119	1/6
toluene	mg/kg	0.017	0.14	6/6
2-butanone	mg/kg	ND	0.095	3/6
bis(2-ethylhexyl) phthalate	mg/kg	ND	0.65	1/6
n-nitrosodiphenylamine	mg/kg	ND	(0.093)	3/6
GROUNDWATER				
toluene	ug/l	ND	1.0	1/2

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOG (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.11.2 Sampling and Analytical Problems

4.1.11.2.1 Loss of Samples

There were no sample loss problems for Site 11 samples. Three soil samples were resampled for semivolatile organic analysis (8270) due to missed holding times. One of these original samples had a soil replicate QC sample taken at the same location. Semivolatile organic analysis was not conducted for the replicate sample because the original sample was not analyzed. When the resample was collected, a new replicate was also collected.

4.1.11.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 11 contained several organic compounds that may be laboratory- or field-induced false positive results. All of the soil samples collected contained acetone, and two of the samples contained methylene chloride. These are common laboratory contaminants.

Several soil samples contained the semivolatile compounds bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and n-nitrosodiphenylamine. Bis(2-ethylhexyl) phthalate and di-n-butyl phthalate were also detected in the method blank at similar concentrations. The phthalate compounds were commonly detected in samples and blanks from throughout the base and are probably false positive results.

Phenol was detected in two soil samples from boring 11-C-1SB at 2.1 and 2.3 mg/kg. This has been traced to a factory-contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Toluene was detected in all of the soil samples at low concentrations. This also occurred for other soil samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is a false positive result.

One soil replicate QC sample was collected at Site 11. Although the results for metals were for the most part comparable, concentrations of organic compounds were not

reproduced. The volatile compound 2-butanone had an RPD of 75 percent. This may be explained because the original sample was collected from the ground surface to 1.5 feet, while the replicate sample was collected on the next push of the sampler from 1.5 to 3.0 feet. Volatile compounds were at much lower concentrations in the surface sample than in the deeper QC sample. Volatilization may have occurred from the near-surface soils leading to lower concentrations and high RPDs.

Conversely, TFH-diesel and lead were detected in the original sample but not in the replicate. Lead probably entered the soils and was attenuated within the first 1.5 feet. The difference for TFH-diesel is not known.

In the second semiannual sampling at well 11-A-1, methylene chloride was not detected in the normal environmental sample or the replicate sample. However, methylene chloride was detected in both the ambient condition blank (850 ug/l, 1,300 ug/l in second column) and the equipment wash blank (730 ug/l, 1,200 ug/l in second column). This has been traced to contaminated Type 1 organic free water which occurred in a number of blanks during that sampling round. In each case, the normal environmental sample did not contain methylene chloride but the blanks did. Toluene was detected in the ambient condition blank but not the sample, field replicate, or equipment wash blank. N-nitrosodiphenylamine was detected below the LOQ in both the sample and the associated method blank.

4.1.11.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site II samples.

4.1.11.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.11.3 Significance of Findings

Soil

Three soil borings were drilled at Site 11 near the edge of the pavement at the AGE maintenance building. All borings encountered a gravel layer at approximately 10 feet and could not be sampled. Surface samples from two of the borings contained TFH. The surface sample from 11-C-3SB contained 84 mg/kg TFH-diesel and 0.014 mg/kg of TCE. The surface sample from 11-C-2SB had 32 mg/kg TFH-gas. Aluminum, barium, beryllium, cadmium, and lead were also detected at levels above averaged ranges from background borings, but were all below respective DHS TTLCs.

Groundwater

Based on Stage 2-1 information, groundwater at Site 11 does not appear to be contaminated in the vicinity of well 11-A-1. However, groundwater may not have been completely characterized as the single well is not placed downgradient of most of the site. The well at Site 11 had standard water quality parameters such as specific conductivity, pH, alkalinity, bicarbonate, and TDS similar to other wells near the flightline at Beale AFB. Other than calcium, potassium, magnesium, iron, and sodium, no other metals were detected in the groundwater.

4.1.11.3.1 Zones of Contamination

The only zone contaminated at Site 11 is the soil adjacent to the pavement to depths of less than 5 feet, based on samples collected during the two IRP investigation stages. Contamination believed to represent actual conditions was not detected in samples below the surface samples. In boring 11-C-3SB no contamination was detected in a replicate sample from 1.5 to 3.0 feet.

Groundwater at Site 11, based on samples collected from well 11-A-1, is not contaminated.

4.1.11.3.2 Contaminant Migration

Contaminants are not expected to migrate from Site 11. Evidence from two independent investigations indicate that contamination is limited to the surface soil. Groundwater, other than the April 1986 sample (0.4 ug/l TCE), or subsurface soils evidently have not been affected.

4.1.11.3.2.1 Potential to Move Off Site and Off Base

The potential for contamination from Site 11 to move off the site or off the base is minimal because contaminants have apparently not reached groundwater in detectable quantities.

4.1.11.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Groundwater in the monitoring well at Site 11 has had no detected contaminants in sampling conducted in the two semi-annual rounds of the Stage 2-1 study. Based on this, the section on migration is not applicable to Site 11.

4.1.11.3.2.3 Time of Travel to Receptors

Other than personnel involved in equipment maintenance, there are no human receptors. If contaminants should migrate into groundwater at detectable levels, water wells to the west of base could be affected.

4.1.11.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 11 because no contaminants have been detected in the groundwater.

4.1.11.3.2.5 Expected Spatial and Temporal Variations in Concentration

No spatial or temporal variations in concentration were observed in the groundwater at Site 11 during Stage 2-1.

4.1.11.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.12 DISCUSSION OF RESULTS FOR SITE 12: ENTOMOLOGY BUILDING 440

As a result of previous investigations conducted at Site 12 AeroVironment concluded that no contaminants were identified. On this basis, it has been determined that no further IRP actions will be taken at this site. A Record of Decision has been prepared for Site 12 and is included in Appendix J of this report.

4.1.13 DISCUSSION OF RESULTS FOR SITE 13: LANDFILL NO. 1

Site 13 was believed to be a trench and fill landfill operation which operated in the 1940s into the 1950s. At least part of the time Landfill No. 1 was in operation, it was a burn dump. The waste type is unknown, but is assumed to have consisted of general domestic refuse. The exact location and orientation of landfill trenches was largely unknown, except where subsidence had occurred. The Stage 2-1 study, through a geophysical investigation, completed in association with Site 20, and materials encountered during drilling, confirmed that landfill trenches did exist and were apparently not in an organized, parallel order as they are at Sites 6 and 15 (Landfills No. 2 and No. 3). The landfill at Site 13 did not have an engineered liner, cover, or leachate collection system. Wells drilled around the approximate perimeter of the landfill did not encounter buried waste materials. Therefore, the landfill boundaries probably fall within an area defined by these boreholes.

During the Stage 2-1 study, five soil borings were drilled at Site 13; one vertical boring at a background location, and four angled borings drilled under landfill trenches to determine soil pore fluid characteristics. Soil contamination was detected in samples from angled boring 13-C-2SB, located in the northwest corner of the landfill.

Six monitoring wells were constructed to supplement the two existing wells. Four rounds of sampling data from the wells and one surface water sample location at Site 13 are discussed below along with data from sampling off base in the third and fourth rounds.

4.1.13.1 Presentation of Results

The following section presents the results of the field investigation at Site 13. The discussion focuses on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on samples of groundwater, surface water, and soil.

4.1.13.1.1 Site Geology

Evaluation of the geology at Site 13 (Landfill 1) is based on boreholes and wells drilled during the current Stage 2-1 investigation, and on wells installed during the Phase II, Stage 1 investigation. During the current investigation, four angled borings were drilled to a depth of 60 feet

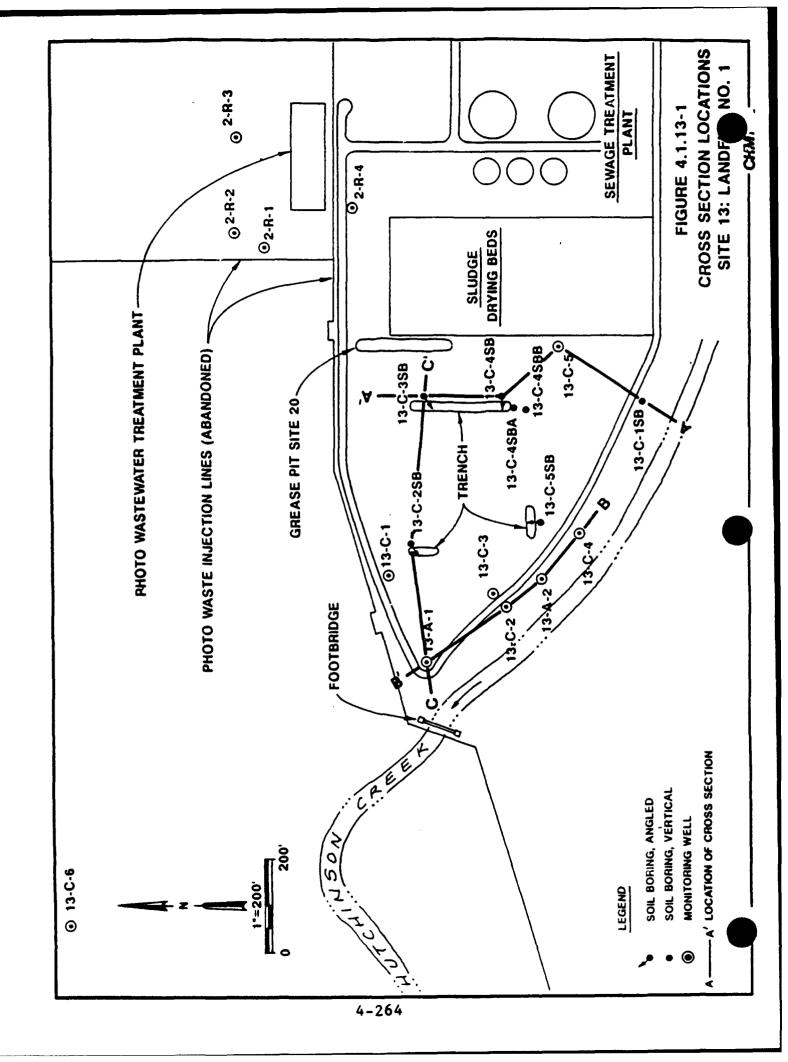
(52 feet beneath the ground surface), and one vertical boring was drilled to a depth of 50 feet. In addition, six new monitoring wells were constructed. Five of these were screened across the first permeable zone in which groundwater was encountered. One additional well was constructed as a paired well, adjacent to a shallow well but screened in a deeper interval. During the previous Phase II, Stage 1 investigation, two shallow monitoring wells were constructed. The location of these wells and boreholes is shown on Figure 4.1.13-1. Soil boring logs are provided in Appendix D.

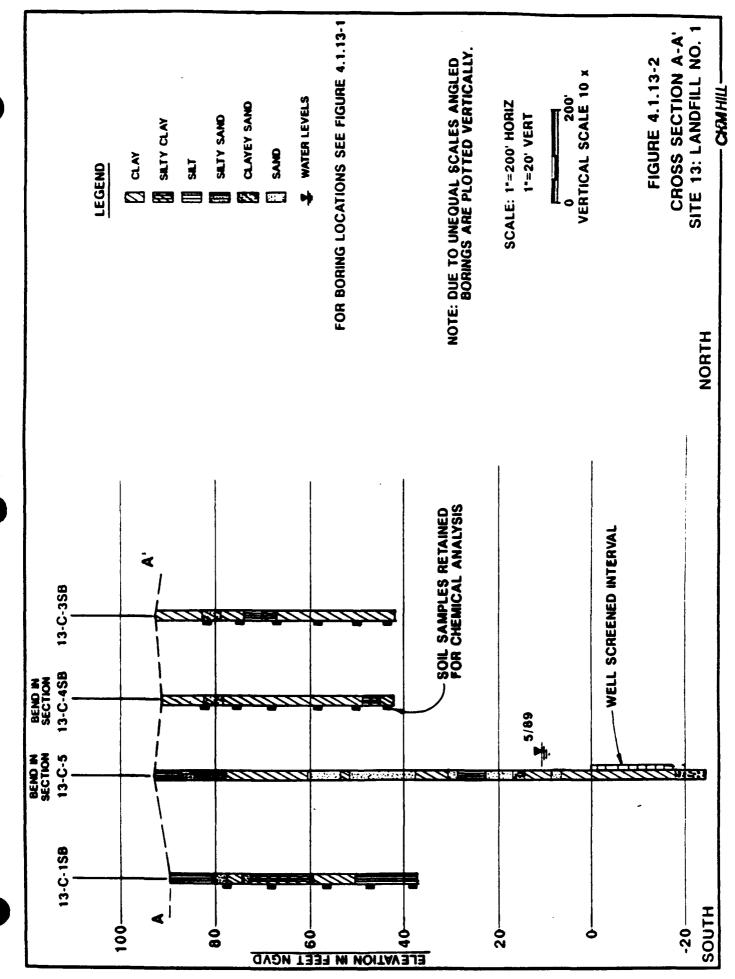
Cross-sections through the soil encountered in soil borings and monitoring wells in the IRP Phase II, Stage 1 and IRP Stage 2-1 studies are located in Figure 4.1.13-1 and are shown in Figures 4.1.13-2, 4.1.13-3, and 4.1.13-4. A key to lithologic symbols is given in Appendix D. The soil encountered in soil borings and monitoring wells at Landfill No. 1 was predominantly fine grained, with low permeability.

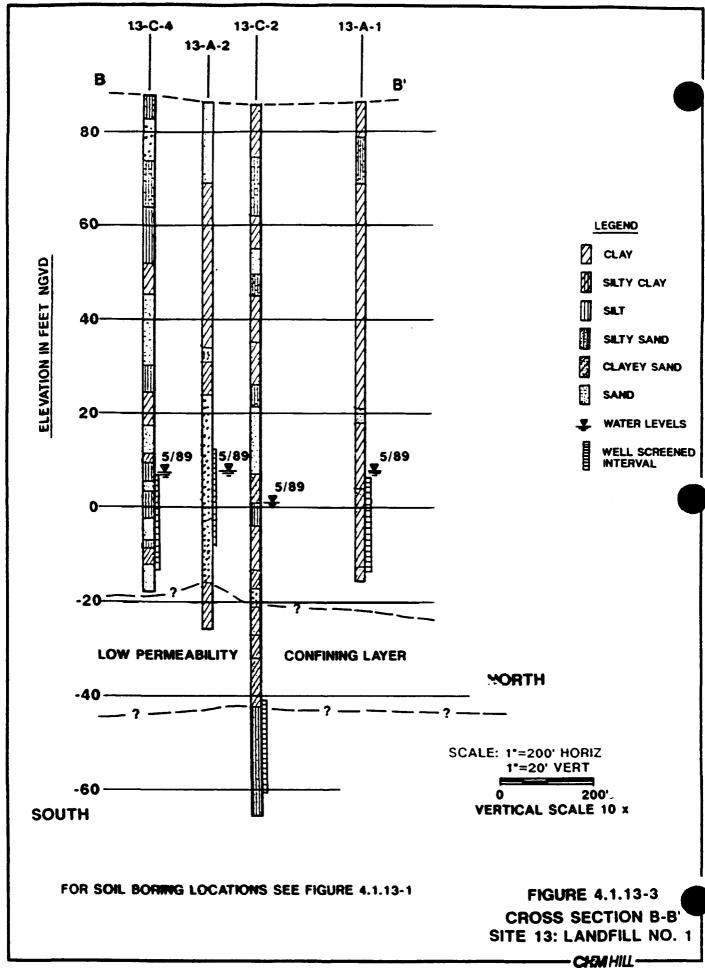
These soils constitute an alluvial sequence and are predominantly fine-grained overbank deposits with occasional discontinuous sand and gravel channel deposits forming permeable zones. This sequence is typical of valley sediments deposited at the base of the Sierra Nevada foothills. Although coarser sand and gravel beds were encountered in this and previous studies, these stream channel deposits are not as common as the much finer-grained overbank and flood plain deposits that predominate.

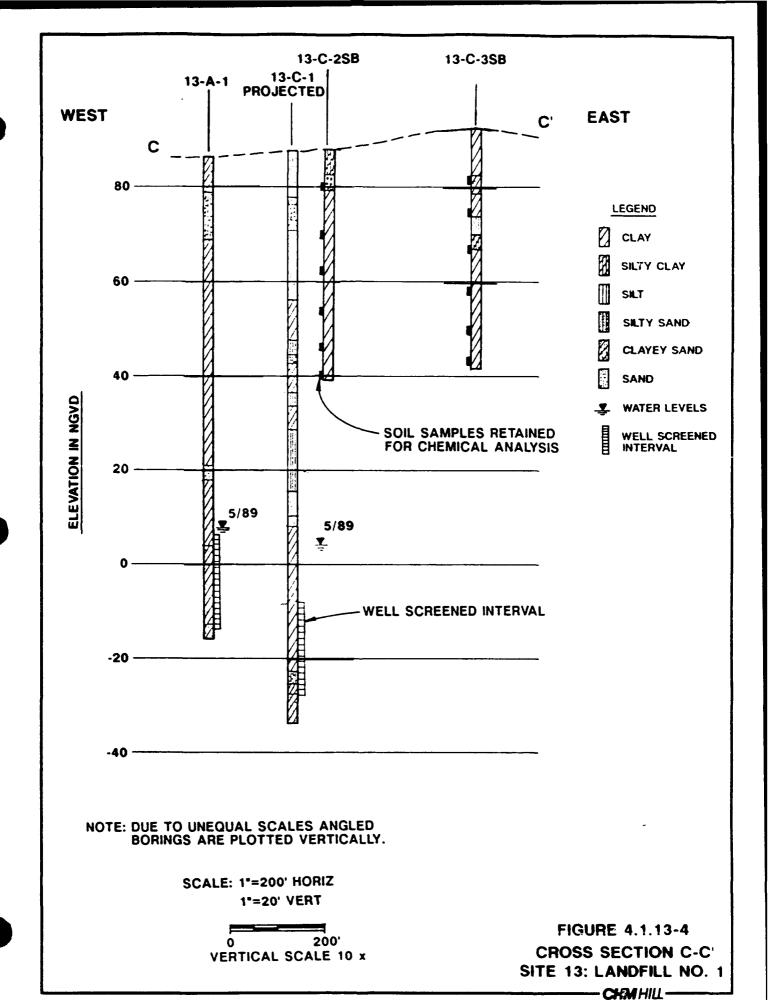
As with many of the near-surface alluvial deposits in the Central Valley, individual beds may generally not be correlated between drilling locations unless they are very close together. The meandering stream depositional environment does not result in laterally extensive deposits but rather produces relatively thin, narrow deposits. Channel deposits of coarse-grained materials, which may be very narrow in cross section, may be continuous for long distances in the direction of stream flow. These channel deposits may serve as migration pathways for contaminants. Because the alluvial materials are extremely heterogeneous, the aquifer hydraulic properties are also heterogeneous.

Near-surface deposits at Site 13 have been mapped as Quaternary river deposits by the Geological Survey (Page, 1980). These materials are the recent channel and flood plain deposits from Hutchinson Creek, which flows along the western boundary of the landfill. Non-volcanic continental alluvium









was encountered to the total depth of all boreholes. Presumably, these deposits belong to the Victor and/or Laguna Formations.

4.1.13.1.2 Site Hydrogeology

The first saturated permeable zone occurs from approximately 80 to 105 feet below grade (10 to -15 feet NGVD). The shallow monitoring wells were completed so the uppermost permeable water-bearing zone encountered during drilling would be screened as noted on the cross sections. Monitoring well 13-A-2 is screened largely in a sand unit. The other shallow wells encountered the first permeable zone below a saturated low permeability silt or clay layer. Regionally, the groundwater system appears to be unconfined. At individual wells, fine-grained sediments and screen placement affect water levels and make comparisons difficult.

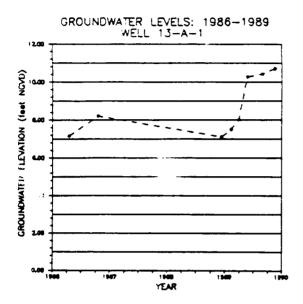
Well 13-C-2 was constructed adjacent to 13-C-3 in the second, or next-to-uppermost, permeable zone encountered during drilling. A 20-foot-thick confining layer from 106 to 126 feet in depth (-20 to -40 NGVD) composed of low permeability lean clays and sandy clays, separates the uppermost permeable zone from the next lower permeable zone in the vicinity of this well. Wells screened above this zone did not respond to pumping below the zone, and vice versa, in pump tests. Well 13-C-2 is screened in silty sands and gravels in the second permeable zone at a depth of 125 to 145 feet below grade (-39 to -59 feet NGVD).

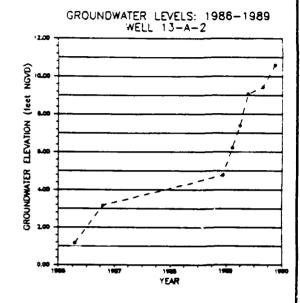
Groundwater levels in the monitoring wells near Landfill No. 1 (Sites 13 and 2) measured between April 1986 and November 1989 are summarized in Table 4.1.13-1 and Figures 4.1.13-5 and 4.1.13-6. Groundwater elevations taken from monitoring wells throughout Beale AFB in March and November 1989 are plotted on Plates 3 and 4. Groundwater elevations at Landfill No. 1 are given in Figure 4.1.13-7; those in the south part of Beale AFB in May 1989 are contoured in Figure 4.1.13-8. These figures show that the groundwater gradient in the uppermost saturated permeable zone in the vicingly of Landfill No. 1 is approximately 0.007 foot per foot co the northwest.

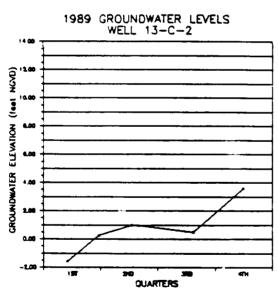
A large groundwater depression west of Beale AFB controls groundwater gradients in the western part of the base. Several off base wells northwest of Landfill No. 1 are measured semiannually by the California Department of Water Resources (DWR). Water levels in these wells dropped steadily from

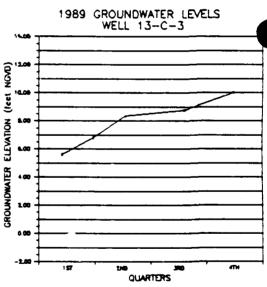
Table 4.1.13-1
GROUNDWATER ELEVATIONS: SITES 13 AND 2
(FEET NGVD)

Well	Screened Interval	April 1986	Oct. <u>1986</u>	Dec. 1988	Feb. 1989	March 1989	May 1989	Aug. 1989	Nov. 1989
2-A-1	-9 to -29	-16.22	-15.57	-6.67	-1.93	0.40	0.91	-0.08	3.96
2-C-1	-62 to -82				-2.43	-0.48	-1.32	-1.8	2.60
2-R-1	13 to -7	5.71		7.68	8.83	9.65	11.36	12.31	13.25
2-R-2	17 to -3	7.05	9.05	8.70	9.03	9.82	11.52	12.48	13.38
2-R-3	15 to 5	10.44	12.27	10.71	11.21	11.85	13.53	14.57	15.36
2-R-4	14 to -6	7.83	9.62	8.86	9.62	10.50	12.30	13.23	14.11
13-A-1	8 to -12	7.15	8.20	7.10	7.49	8.01	10.27	10.42	10.71
13-A-2	14 to -6	1.15	3.16	4.77	6.21	7.38	9.06	9.43	10.60
13-C-1	-7 to -27				2.90	3.78	5.28	6.16	7.87
13-C-2	-39 to -59				-1.57	0.26	1.00	0.49	3.59
13-C-3	l to -19	*-			5.61	6.81	8.35	8.77	10.03
13-C-4	8 to -12				6.14	7.3 6	8.91	9.29	10.51
13-C-5	0 to -20				7.77	8.93	10.64	11.25	12.35
13-C-6	4 to -16								0.76



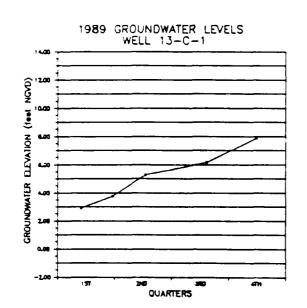


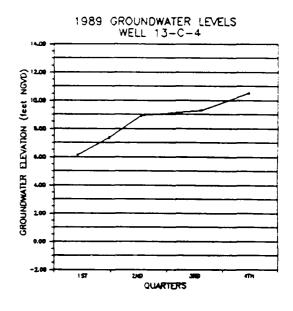




NOTE: VARING TIME SCALES

FIGURE 4.1.13-5
MONITORING WELL HYDROGRAPHS
SITE 13: LANDFILL NO. 1





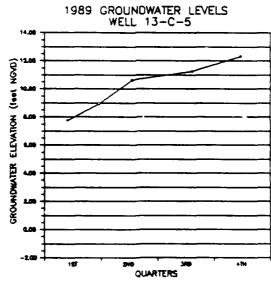
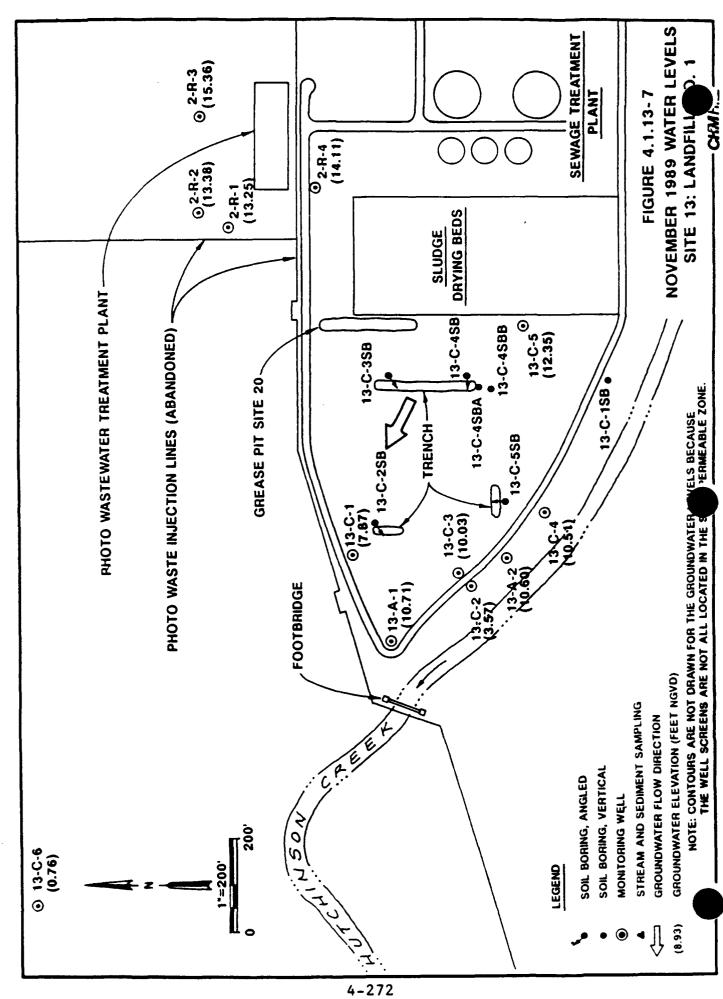
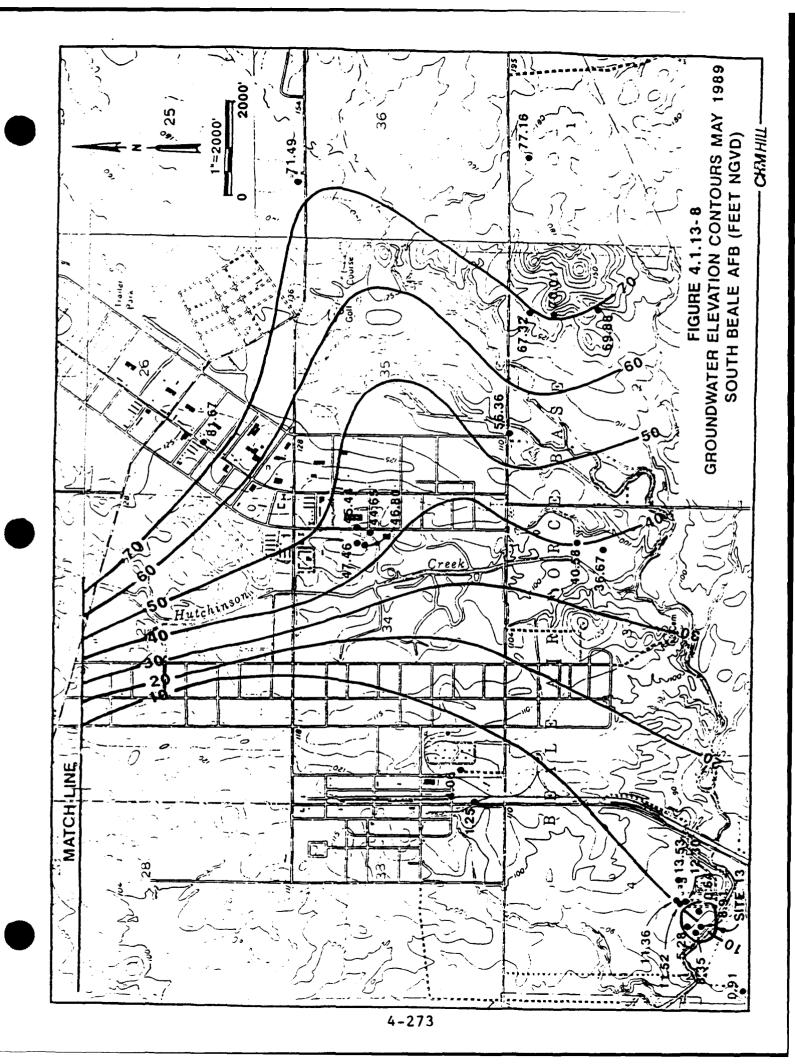


FIGURE 4.1.13- 6
MONITORING WELL HYDROGRAPHS
SITE 13: LANDFILL NO. 1





the 1940s until 1981. From 1981 through 1987, the last year data were available, water levels have typically risen 20 feet or more in those wells. As described in Section 4.1.2.1.2, since 1984 water levels have risen 30 feet in the deep monitoring well (364 feet) located near the injection wells in Site 2 about 600 feet west of Site 13.

Groundwater levels in monitoring wells screened in the uppermost permeable zone in the western part of Beale AFB have risen 3 to 20 feet above the 1986 levels measured by Aero-Vironment (Table 4.1.13-1). The most plausible explanation for this is a reduction in agricultural pumping, or an increase in recharge west of the base, or a combination, resulting in the rise in water levels observed by DWR for wells northwest of Landfill No. 1.

At Landfill No. 1, groundwater levels in monitoring well 13-A-2 rose 9.5 feet from April 1986 to November 1989, while the groundwater level in monitoring well 13-A-1 rose 3.6 feet. During pump testing of all the new monitoring wells at Site 13, the groundwater level in monitoring well 13-A-1 did not change when nearby monitoring wells were pumped for 4 to 12 hours. Well 13-A-1 also has anomalously high groundwater levels compared with nearby wells.

The groundwater levels in the four monitoring wells (2-R-1, -2, -3, and -4) installed by Radian at the PWTP (Site 2) northeast of Landfill No. 1 had relatively small groundwater level changes between 1986 and 1989, typically rising 4.9 to 7.5 feet (Table 4.1.13-1). Groundwater levels in the paired monitoring wells 13-C-2 and 13-C-3 indicate a downward vertical gradient between the first and second permeable zones at Site 13. The May 1989 groundwater level in shallow monitoring well 13-C-3 was 8.35 feet NGVD; in the paired deep monitoring well 13-C-2 it was 1.00 feet NVGD, 7.35 feet below that in 13-C-3. This demonstrates a 7.35-foot head difference across the 20-foot-thick, low-permeability lean clay and clayey sand that acts as a localized aquitard between the two permeable zones. A downward gradient implies that Site 13 lies in a groundwater recharge zone. This is consistent with Site 13's location within the groundwater depression described above.

During pump testing of the new monitoring wells at Landfill No. 1, the groundwater level in the deep monitoring well, 13-C-2, did not change in response to 4 to 12 hours of pumping in shallow monitoring wells 13-C-1, -3, -4, or -5. None of the shallow monitoring wells exhibited groundwater level changes in response to 4 hours of pumping in deep monitoring

well 13-C-2. These observations imply that fine-grained sediments have delayed the vertical response at Site 13 near this well. However, the effectiveness of these fine-grained sediments in restricting downward migration of groundwater across the site is unknown.

Aquifer parameters were derived according to the Cooper-Jacob method from the water level drawdown and recovery data generated during the pump tests of the new monitoring wells at Site 13. A summary of calculated aquifer properties is given in Table 4.1.13-2. Plots of the data and a discussion of testing methodology are provided in Appendix E. Calculated aquifer properties are summarized. Transmissivities (T) ranged from 230 to 1,200 square feet per day with an average value of 580 square feet per day. Hydraulic conductivity (K) was estimated by dividing the transmissivity (T) by the saturated screened thickness (b) of the well. Hydraulic conductivity ranged from 11 to 74 feet per day with an average value of 32 feet per day $(1.1 \times 10^{2} \text{ cm/sec})$. Storativity values are in the range expected for confined aquifers (Freeze and Cherry, 1979). However, because of the complexity of the groundwater system, values for aquifer parameters should be regarded as estimates.

Linear groundwater velocity can be roughly estimated using Darcy's Law. For Site 13, a representative value of the hydraulic conductivity may be assumed to be about 28 feet per day, as determined in the 72-hour test in well 19-C-4. The regional groundwater gradient in the vicinity of Landfill No. 1 is 0.007 feet per foot. The estimated effective transport porosity for the permeable sediments, through which groundwater will flow preferentially, is assumed to be about 20 percent (0.20). Using these values gives a groundwater velocity of about 1.0 feet per day, or 360 feet per year.

4.1.13.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.13.1.4 and in Appendix A.

Table 4.1.13-2
SITE 13: SUMMARY OF PUMP TEST RESULTS
(Cooper-Jacob)

Date	Obser- vation <u>Well</u>	Pumping _Well	Type of	Length of Test (hr)	Trans- missivity T _(ft²/d)	Aquifer Thickness b (ft)	Hydraulic Conductivity K (ft/d)	Storativity S
2/89	13-C-1	13-C-3	Drawdown	12	780	20.0	39	4.7x10-4
2/89	13-C-1	13-C-1	Drawdown	1.7	270	20.0	13.5	
2/89	13-C-1	13-C-1	Recovery	1.7	230	20.0	11	
-,			,		230	20.0	••	
2/89	13-C-2	13-C-2	Drawdown	6	380	20.0	19	
2/89	13-C-2	13-C-2	Recovery	6	440	20.0	22	
-,			-		,			
2/89	13-C-3	13-C-3	Drawdown	12	390	20.0	19	
2/89	13-C-3	13-C-3	Recovery	12	450	20.0	23	
			,					
2/89	13-C-4	13-C-3	Drawdown	4	250	19.0	13	
2/89	13-C-4	13-C-3	Recovery	4	390	19.0	21	
2/89	13-C-4	13-C-3	Drawdown	12	990	18.8	53	5.1x10 ⁻⁴
2/89	13-C-5	13-C-3	Drawdown	4	380	20.0	19	
2/89	13-C-5	13-C-3	Recovery	4	380	20.0	19	
2/89	13-C-5	13-C-3	Drawdown	12	1,100	20.0	57	5.9x10-4
					-,			
9/89	13-C-6	13-C-6	Drawdown	4	78	15.9	4.9	
9/89	13-C-6	13-C-6	Recovery	4	280	15.9	18	
			•			•••		
2/89	13-A-2	13-C-4	Drawdown	4	1,100	15.0	74	9.1x10-4
2/89	13-A-2	13-C-4	Recovery	4	1,200	15.0	63	
2/89	13-A-2	13-C-3	Drawdown	12	570	14.6	39	9.6x10-4
2/89	13-A-2	13-C-3	Recovery	12	540	14.6	37	
-			· - - /					

Notes: Assume b = saturated thickness of screen.

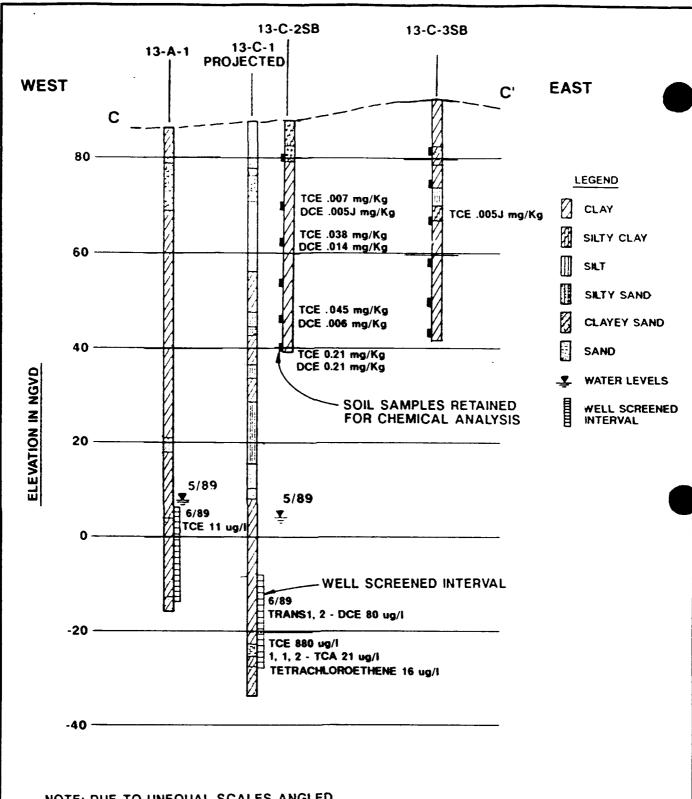
A total of 29 soil boring samples were collected at Site 13: 5 from a vertical background boring and 24 from the four angle borings under landfill trenches. These samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method).

TCE and trans-1,2-DCE were detected in boring 13-C-2SB (Figure 4.1.13-9). TCE was detected in samples from depths of 18, 28, 48, and 58 feet (actual vertical depths equal 16, 24, 42, and 50 feet) at 0.007, 0.038, 0.045, and 0.21 mg/kg. Trans-1,2-DCE was detected at the same depths at 0.005 (below LOQ), 0.014, 0.006, and 0.21 mg/kg. 1,1,2 trichloroethane was detected at 0.009 mg/kg at 48 feet (42 feet vertically) and 0.062 mg/kg at 58 feet (50 feet vertically). The 58-foot sample also had tetrachloroethane estimated below the LOQ, and chloroform at 0.006 mg/kg. In the 48-foot sample from boring 13-C-3SB TCE was detected below the LOQ. Chloroform was detected at 0.006 mg/kg at 38 feet and below the LOQ at 28 feet. Toluene was detected in 25 of 29 soil samples at up to 0.065 mg/kg.

Semivolatile organic chemicals were detected in several soil samples at Site 13. Bis(2-ethylhexyl) phthalate was detected in five samples at up to 0.21 mg/kg. Di-n-butyl phthalate was detected in 16 samples at up to 5.4 mg/kg. Butyl benzyl phthalate was detected in one sample at 0.54 mg/kg. ICP metals were detected in Site 13 soil samples at concentrations generally similar to background Twelve of the 24 soil samples from angled borings contained from one to three metals at concentrations greater than two standard deviations above the mean average ICP metal values for background soil borings at Beale AFB. These metals were aluminum, barium, calcium, iron, magnesium, manganese, nickel, and potassium. Mercury was detected at boring 13-C-3SB at 0.24 mg/kg at 8 feet (7 feet actual vertically) and 0.11 mg/kg at 18 feet (16 feet actual vertically). TFH-gas was found at 30 mg/kg at 28 feet (24 feet actual vertically) in 13-C-5SB.

Groundwater

During the IRP Phase II, Stage 1 investigation (AeroVironment, 1987) TCE was detected at downgradient monitoring wells 13-A-1 and 13-A-2 in the April and October 1986 sampling rounds. TCE was detected at 13-A-1 at 0.4 ug/l in the



NOTE: DUE TO UNEQUAL SCALES ANGLED BORINGS ARE PLOTTED VERTICALLY.

SCALE: 1"=200' HORIZ 1"=20' VERT

> 0 200' VERTICAL SCALE 10 x

FIGURE 4.1.13-9

IN SOIL AND GROUNDWATER
CROSS SECTION C-C'
SITE 13: LANDFILL NO. 1

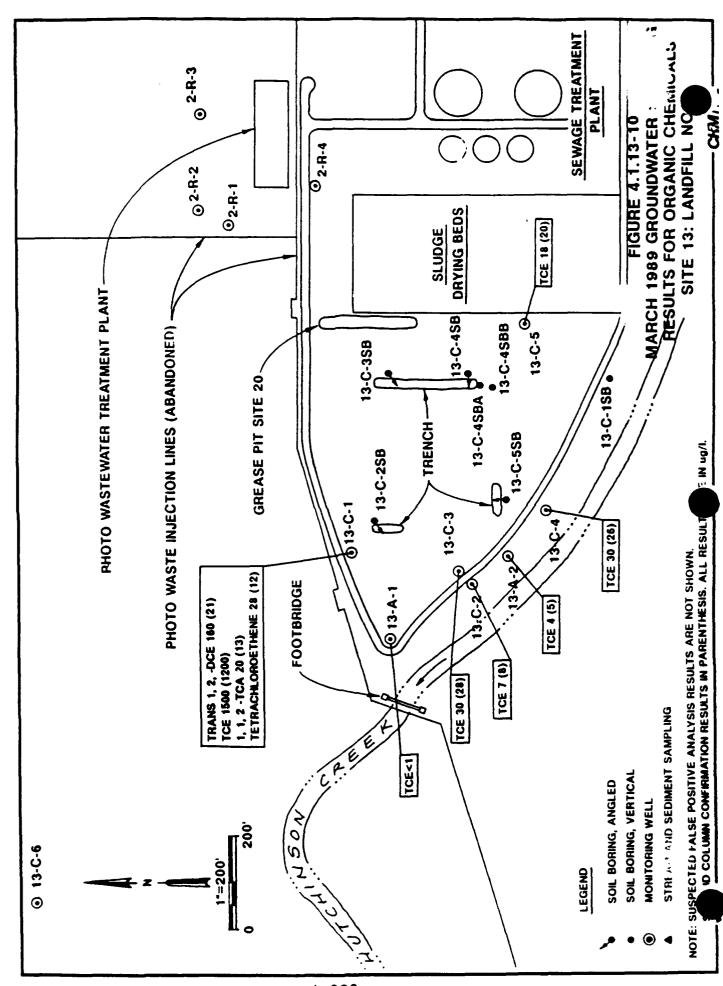
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first round and 28 ug/l in the second. TCE was detected at 13-A-2 at 106 ug/l in the first round and 0.4 ug/l in the 13-A-2 in the second round. Trans-1,2-DCE was detected in 13-A-2 at 3.8 and 0.5 ug/l in the first and second rounds. Barium ranged from less than 0.050 mg/l to 0.100 mg/l. Silver was detected only in the first round in 13-A-1 at 0.040 mg/l. The pesticide 2,4-D was detected at 0.09 ug/l in 13-A-1 and 13-A-2 in the second round.

Through the four quarterly rounds of water sampling at Site 13, 35 groundwater samples and 4 surface water samples were collected. Analyses performed for water samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7421), mercury (7470/7471), selenium (7740), water quality parameters, TFH-diesel and -gas (California method), and COD.

Results from the first quarterly sampling round (February and March, 1989) of the Stage 2-1 investigation (Figure 4.1.13-10) indicate the highest level of contamination was in monitoring well 13-C-1 on the northwest edge of Landfill No. 1, located approximately 80 feet downgradient from boring 13-C-2SB, in which TCE was detected as discussed above. In the first sampling round TCE was present at 1,500 ug/l (1,200 ug/l in second column). Trans-1,2-DCE was detected at 160 ug/l (21 ug/l in second column). 1,1,2-Tetrachloroethane (TCA) was detected at 20 ug/l (13 ug/l in second column). Tetrachloroethane was detected at 28 ug/l (12 ug/l in second column) and chloroform was detected at 2 ug/l (2 ug/l in second column).

TCE was detected in samples collected from other monitoring wells at Landfill No. 1 at much lower levels than found at 13-C-1. It was detected in 13-C-3 at 30 ug/1 (28 ug/1 in second column), in 13-C-4 at 30 ug/1 (26 ug/1 in second column), and in 13-C-5 at 18 ug/1 (20 ug/1 in second column). Well 13-A-2 had 4 ug/1 with 5 ug/1 in the second column confirmation. Second column confirmation data were within the acceptable RPD range of 25 percent. Groundwater samples collected from monitoring well 13-A-1 did not have detectable TCE. At deep monitoring well 13-C-2, TCE was detected at 7 ug/1 in the first column and in second column confirmation at 8 ug/1. Trans-1,2 DCE, 1,1,2-TCA, chloroform, and tetrachloroethane were not detected in samples from these monitoring wells at Landfill No. 1 in the first sampling round.



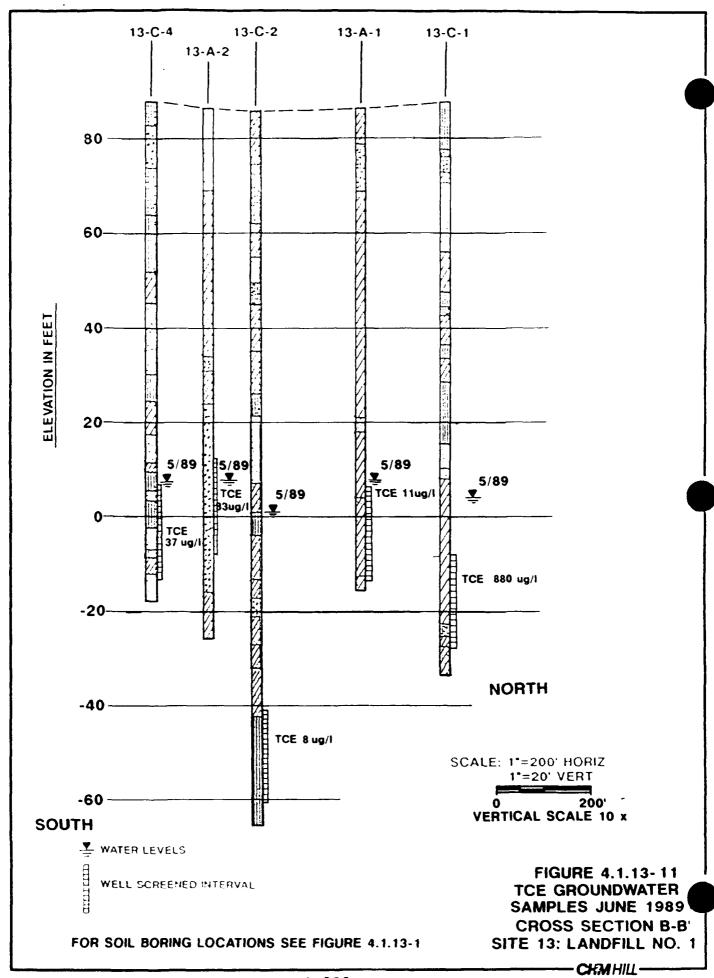
Toluene was detected in monitoring well 13-C-4 at 11 ug/l (15 ug/l in second column confirmation). The RPD is 31 percent, which is outside the acceptable RPD of 14 percent. detected in any groundwater samples at an LOQ of 0.10 ug/l. Mercury was detected in monitoring well 13-C-5, at 0.0008 mg/l, just above the LOQ of 0.0005 mg/l. Barium was not detected in any groundwater samples at an LOQ of 0.10 ug/l.

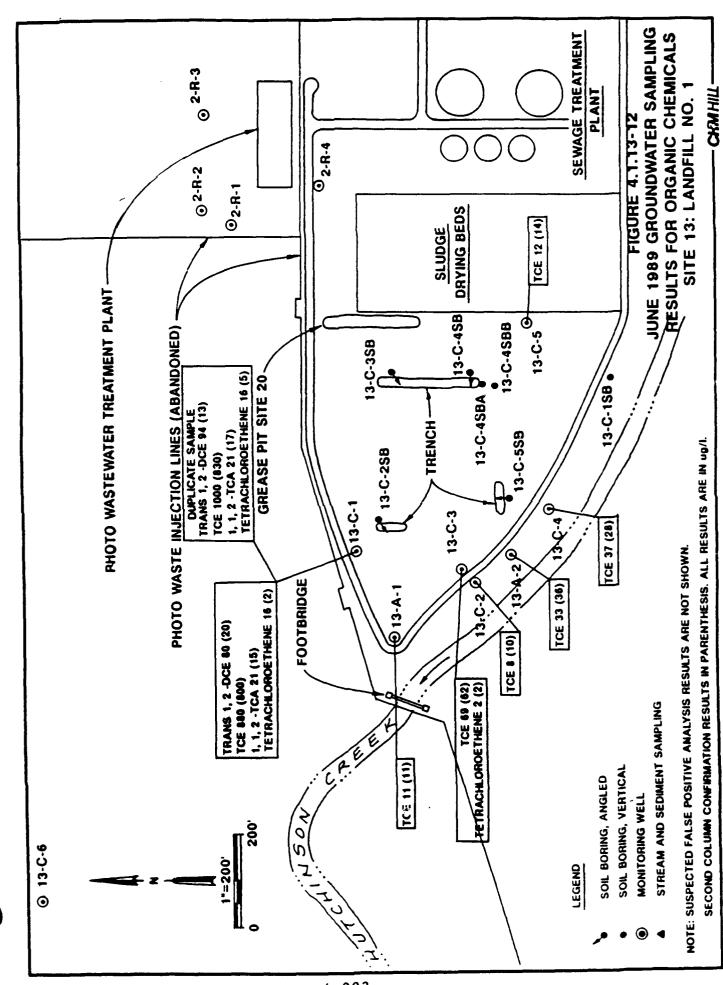
Results from the second quarterly sampling round in June 1989 (Figures 4.1.13-11 and 4.1.13-12) also indicate the highest level of contamination in well 13-C-1. TCE was detected at 880 ug/l in the original sample (800 ug/l in second column) and 1,000 ug/l in a field replicate (830 ug/l in second column). Trans-1,2,-DCE was detected at 80 ug/l (20 ug/l in second column) in the original sample and 94 mg/l (13 ug/l in the second column) in a field replicate. Tetrachloroethene was detected at 16 ug/l, 1,1,2-trichloroethane at 21 ug/l, and chloroform at 1 ug/l in both the original and replicate samples. For tetrachloroethene, the second column result in the original was 2 ug/l and in the field replicate 5 ug/l; for 1,1,2-trichloroethane 15 and 17 ug/l and for chloroform 1 ug/l and 1 ug/l.

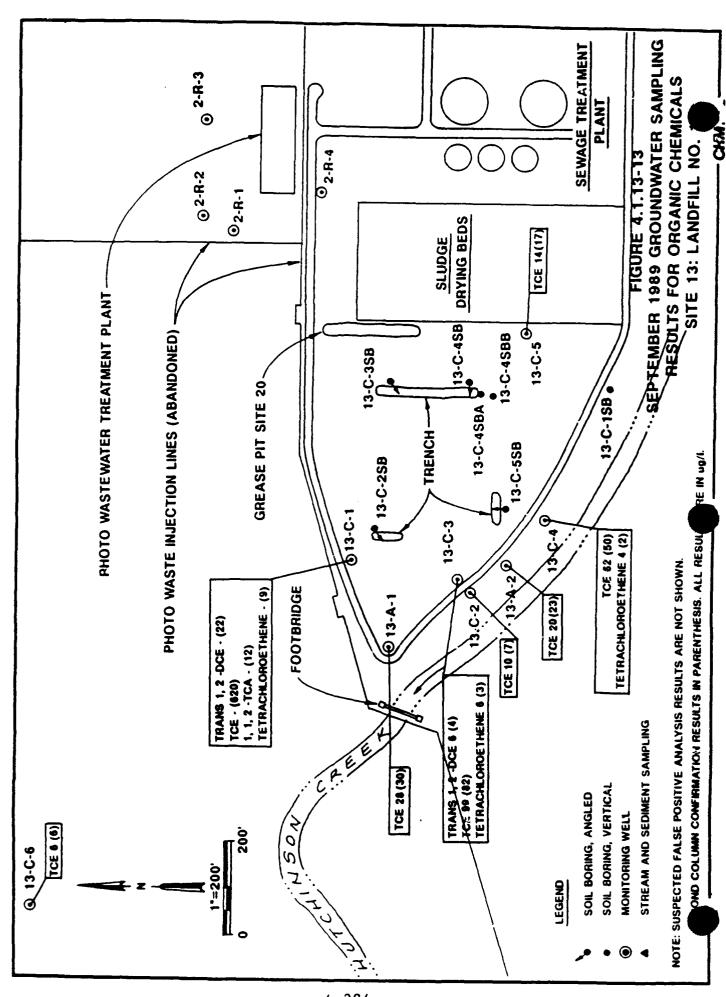
In the second round, TCE was detected in all other Landfill No. 1 monitoring wells, including 13-A-1, at much lower levels than 13-C-1 (Figure 4.1.13-12). Concentration variations are plotted on cross section B-B' in Figure 4.1.13-11. TCE was present in deep monitoring well 13-C-2 (8 ug/l, 10 ug/l in second column), and shallow wells 13-C-3 (69 ug/l, 62 ug/l in second column), 13-C-4 (37 ug/l, 28 ug/l in second column), 13-C-5 (12 ug/l, 14 ug/l in second column), 13-A-1 (11 ug/l, 11 ug/l in second column), and 13-A-2 (33 ug/l, 36 ug/l in second column). Tetrachloroethene was detected in well 13-C-3 (2 ug/l, 2 ug/l in second column). The RPDs for these samples are within acceptable ranges. No mercury, arsenic, lead or selenium was detected at Landfill No. 1 in the second sampling round.

General water quality parameters in the second round were generally similar to those in the first quarter sampling, although TDS (594 mg/l) and chloride (129 mg/l) were higher in 13-A-1. Manganese was detected only in background well 13-C-5 at 0.456 mg/l.

Results from the third quarter sampling round in September 1989 (Figure 4.1.13-13) also indicated the highest level of contamination in well 13-C-1. This sample was first screened using the 8010 analysis on the gas chromatograph, which was normally used for second column confirmations. TCE was detected at 620 ug/l. Trans-1,2,-DCE was detected at







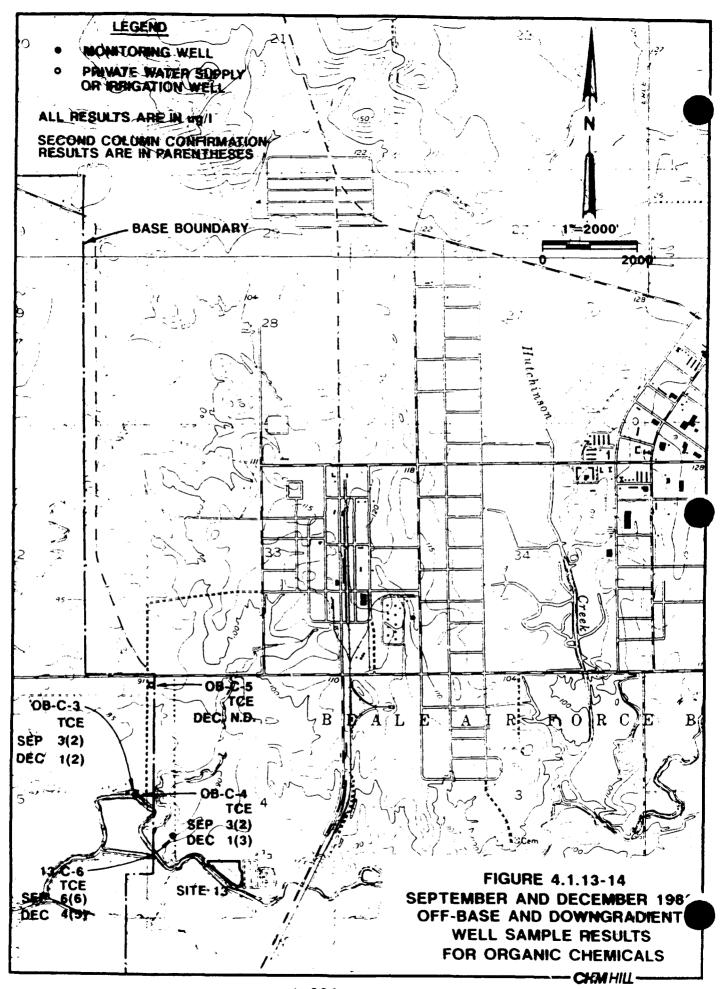
22 ug/l. Tetrachloroethene was detected at 9 ug/l, 1,1,2-trichloroethane at 12 ug/l, and chloroform at 1 ug/l. The sample was then run in the gas chromatograph normally used for first column data. In successive analyses run at 100 to 1 dilution, 10 to 1 dilution and with no dilution, no organic compounds were detected. The reason for this is not known but may have been a sample handling problem. A letter from the chemist responsible for the analyses is included in Appendix A.

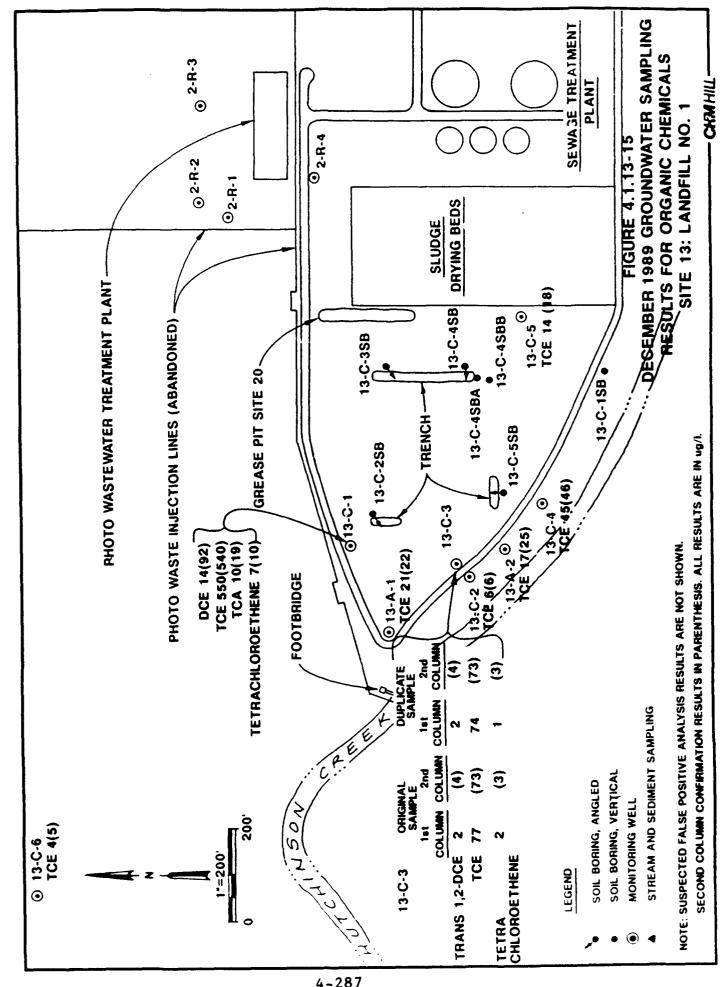
During third quarter sampling, TCE was again detected in all other Landfill No. 1 monitoring wells at much lower levels than 13-C-1. TCE was present in deep monitoring well 13-C-2 (10 ug/l, 7 ug/l in second column), and shallow wells 13-C-3 (99 ug/l, 82 ug/l in second column), 13-C-4 (62 ug/l, 50 ug/l in second column), 13-C-5 (14 ug/l, 17 ug/l in second column), 13-C-6 (6 ug/l, 6 ug/l in second column), 13-A-1 (28 ug/l, 30 ug/l in second column), and 13-A-2 (20 ug/l, 23 ug/l in second column). The presence of 6 ug/l TCE in the new downgradient monitoring well 13-C-6 indicates that TCE has spread downgradient at least 1,000 feet northwest from Landfill No. 1. No mercury, arsenic, lead, or selenium was detected in the third sampling round.

General water quality parameters were similar to those in the first and second rounds. Manganese was detected at $0.436 \, \text{mg/l}$ in well 13-C-5.

An off base private water supply well was sampled for purgeable halocarbons (8010) analysis for the first time during the third quarterly water sampling round. It is located west of the base boundary about 2,200 feet northwest of Site 13 (Figure 4.1.13-14). This private well was sampled from two locations. The first sample (OB-C-3) was taken from a 5-inch diameter agricultural spigot near the well head located in front of the caretaker's cottage which had 2 ug/1 TCE. The second sample (OB-C-4) from the well was taken from an outside faucet in back of the caretaker's cottage which also had ? ug/1 TCE. No other volatile organic compounds were det cted in either sample. These offbase samples are included in Table 4.1.13-3 in Section 4.1.13.1.4.

TCE was detected in all wells at Site 13 in the fourth quarter sampling round and the levels were generally similar to the third round (Figure 4.1.13-15). Well 13-C-1 again had the highest level with 550 ug/1 (540 ug/l in the second column). Trans-1,2-DCE was detected at 14 ug/l (92 ug/l in the second column), 1,1,2-Trichloroethane at 10 ug/l (19 ug/l in the second column), and tetrachloroethene at





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7 ug/l (10 ug/l in the second column). Similar compounds were detected at lower levels in the original and duplicate samples from well 13-C-3. TCE was detected at 77 ug/l (73 ug/l in the second column) in the original and 74 ug/l (73 ug/l in the second column) in the duplicate. Trans-1,2-DCE was detected at 2 ug/l (4 ug/l in the second column) in the original and the same levels in the duplicate. Tetrachloroethene was detected at 2 ug/l (3 ug/l in the second column) in the original and l ug/l (3 ug/l in the second column) in the duplicate.

TCE was also detected at 21 ug/l (22 ug/l in the second column) in 13-A-1, at 17 ug/l (25 ug/l in the second column) in well 13-A-2, 45 ug/l (46 ug/l in the second column) in 13-C-4, 14 ug/l (18 ug/l in the second column) in background well 13-C-5, 6 ug/l (6 ug/l in the second column) in deep well 13-C-2, and 4 ug/l (5 ug/l in the second column) in the downgradient well 13-C-6.

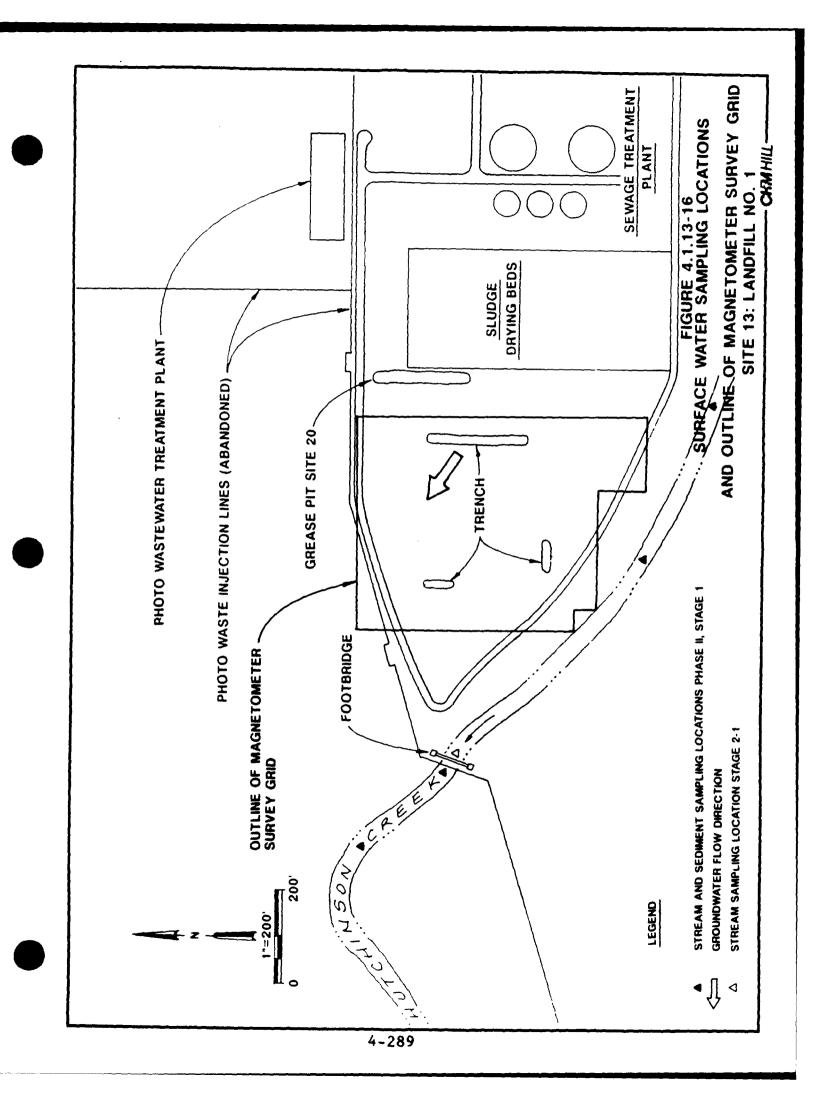
Manganese was detected at well 13-C-5 at 0.278 mg/l and at well 13-C-6 at 0.0183 mg/l. Water quality parameters were similar to previous rounds.

The off-base well at Deep Violet Farms was sampled again in the fourth quarter (Figure 4.1.13-14). Sample OB-C-3 had 1 ug/1 TCE (2 ug/1 in the second column) and OB-C-4 had 1 ug/1 TCE (3 ug/1 in the second column). Another well located about 2,300 feet north of Deep Violet Farms was sampled for 8010 analyses (OB-C-5) and had no detected compounds.

Through the four sampling rounds at Landfill No. 1, total dissolved solids (TDS) in groundwater ranged from 146 to 594 mg/l. Groundwater is a calcium-magnesium bicarbonate type. Nitrite plus nitrate (expressed as nitrate) ranged from 5 to 33.2 mg/l. Chemical oxygen demand (COD) was below the 7 mg/l LOQ.

Surface Water

Surface water and bottom sediments (0-0.5 foot) in Hutchinson Creek adjacent to Landfill No. 1 were sampled in four locations in November 1985 by AeroVironment (Figure 4.1.13-16). The surface water sampling was repeated in April 1986 (AeroVironment, 1987). Low levels of the organ-ochlorine pesticides gamma-BHC (Lindane), Aldrin, and the chlorophenoxy herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) were detected in the surface water samples. Lindane was detected in all but one sample from both sampling rounds



(0.04-0.11 ug/1). Aldrin was detected in all of the second round samples at concentration near the method detection limit and well below the LOQ. O Aldrin was detected during the first round. 2,4-D was detected in three samples below the LOQ.

The first quarterly surface water sample collected as part of the current Stage 2-1 activities was taken below the foot bridge across Hutchinson Creek in February 1989. No volatile or semivolatile organic compounds were detected. Lead was detected at the 0.005 mg/l LOQ. TDS was 169 mg/l. The surface water cations were of no dominant type with 50 percent bicarbonate anions. Nitrate was 12.6 mg/l. COD was 19.7 mg/l, similar to the 18.5 mg/l detected upstream at Landfill 2.

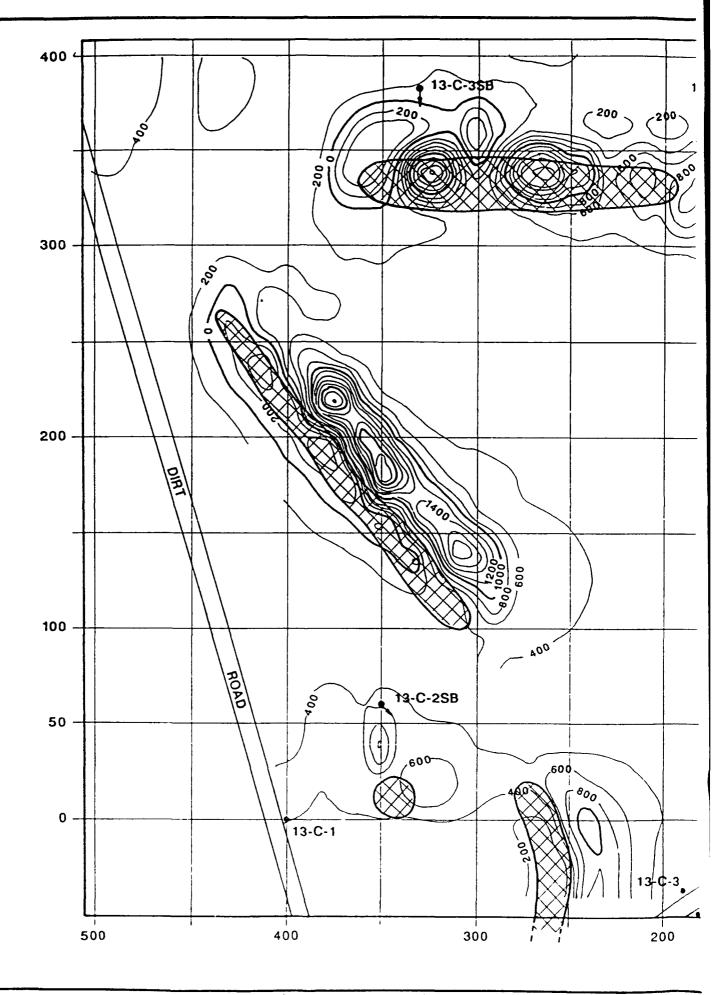
The second round sampling included a replicate sample. Nitrate increased to 74.0~mg/l (66 mg/l in replicate). COD increased to 56.3~mg/l (63.6 mg/l in replicate), higher than the 13.3~mg/l detected upstream at Landfill No. 2. TDS increased to 427~mg/l (418 in the replicate). No lead or volatile or semivolatile organic compounds were detected.

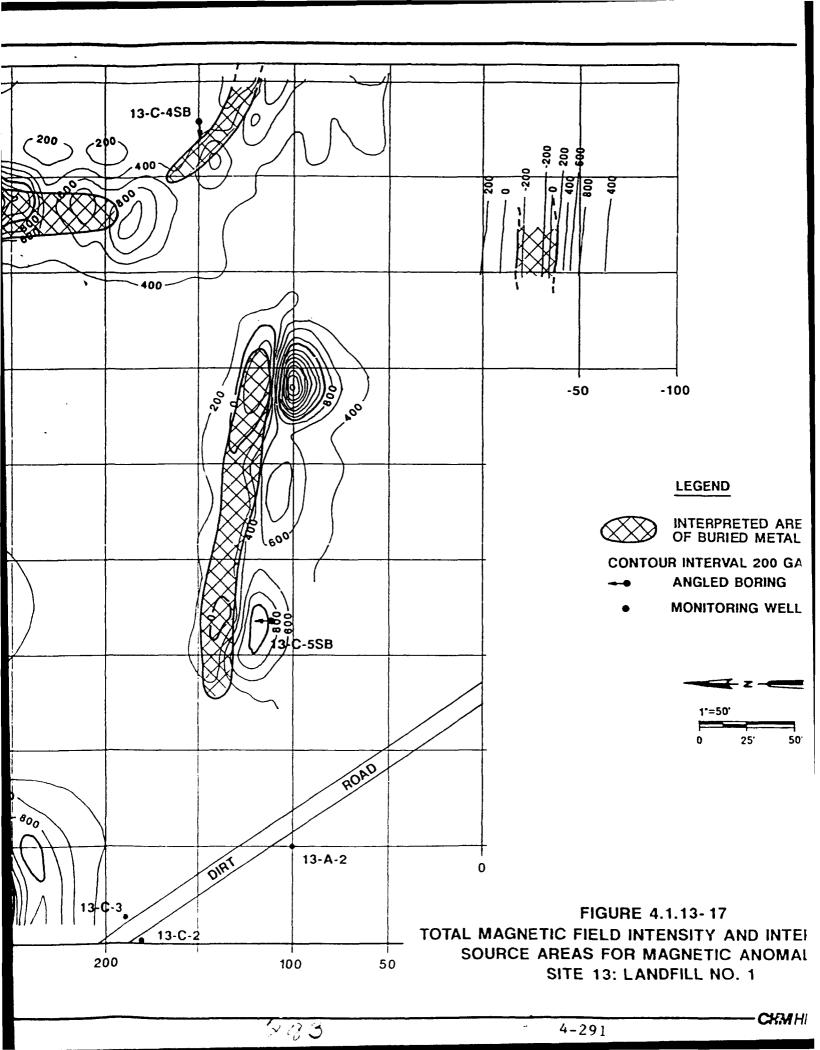
In the third round sample, nitrate dropped to 36.9 mg/l. COD was not detected at Site 13 but was 25.8 mg/l upstream at Site 6. TDS was 398 mg/l. Again, no lead or volatile or semivolatile organic compounds were detected.

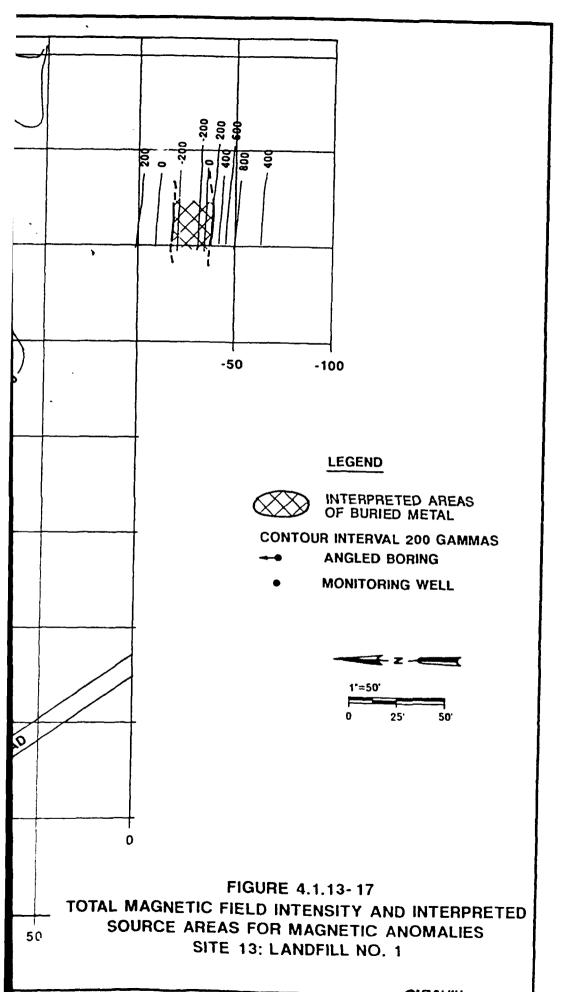
A replicate surface water sample was taken in the fourth round. Nitrate increased to 75.8 mg/l (66.9 in the replicate). COD was 44.5 mg/l (41.2 in the replicate), higher than the 18.5 mg/l upstream at Site 6. TDS was 415 mg/l (352 in the replicate). Lead was detected in the replicate sample at 0.0417 mg/l, but was not detected in the original sample. No volatile or semivolatile organic compounds were detected. Arsenic, mercury, selenium, and total fuel hydrocarbons -gas and -diesel were not detected in surface water at Site 13. Surface water was a sodium-magnesium bicarbonate type in the first round, and sodium chloride in the second and third rounds and sodium chloride bicarbonate in the fourth round.

Geophysics

A geophysical investigation (magnetometer survey) was conducted in the vicinity of the grease pit (Site 20), adjacent to Landfill No. 1, to determine the locations of backfilled trenches. The outline of the magnetometer survey grid is given in Figure 4.1.13-16. Figure 4.1.13-17 shows the area







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interpreted from a magnetic field survey to have buried metal. Geophysical scan lines are presented in Appendix H. The magnetic source areas were generally associated with shallow depressions.

Seven areas of buried metal were delineated. Three of these were not fully covered with the magnetometer because the scope of work limited the geophysical investigation in the vicinity of Site 20 (and, therefore, Landfill No. 1) to one day. Time did not permit full delineation of the landfill trenches.

4.1.13.1.4 Analytical Results Table

Table 4.1.13-3 presents a summary of all detected analytes for Site 13. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.13-3 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.13.1.5 Discussion of Analytical Data

Contaminants were detected in both soil and groundwater samples collected at Site 13. With the exception of lead, which was detected at the LOQ, no contaminants were detected in the surface water sample. Table 4.1.13-4 presents the range of contaminants encountered for each of the media sampled (soil, groundwater, surface water), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the limit of quantification. These detections may represent laboratory "noise" and the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study the

TABLE 4.1.13-3

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 13

				Standards, and Action	Criteria Levels (a)	13-C-158 BAFB-0106	13-C-158 BAFB-0107	13-C-158 BAFB-0108	13-C-158 BAFB-0111	13-C-15B BAFB-0113	13-C-25B BAFB-0252
Parameter	Method	Detection Limit	Units	Federal	State	10.0-11.5 12/06/88	20.0-21.5° 12/06/88	30.0-31.5 12/06/88	40.0-41.5 12/07/88	51.0-52.5 ¹ 12/07/88	7.5-9.0' 12/15/88
Percent Moisture	ASARP	V/#	×	SN	SM	7.0	26.5	27.8	19.8	17.5	9.5
Aluminum	Su6010	20.0	mo/kg	SI	SN	5030	16600	17300	11900	14100	17100
Barium	Su6010	10.0	mg/kg	SH	10,000	46.5	1 8	141	72.3	393	122
Calcium	Su6010	5	mg/kg	SM	SE	2580	10400	5140	4390	7,880	2040
Chromium	S46010	3.0	MO/kg	SH	(70)	16.1	6.05	9.62	1 27.8	3 37.2 (32.9
Cobeit	Su6010	4.0	mo/kg	SE	8,000	7.1	33.5	13.9	18.7	23.0	18.7
Copper	SW6010	3.0	MQ/kg	SE	2,500	26.3	65.9	37.3	44.1	40.5	45.7
182	S46010	10.0	mo/kg	SH	SE	11800	56800	3 24500 6	26700 1	3 27600 1	28400
Megnesium	Su6010	5	mo/ko	SE	SR	2160	10100	6570	2560	2670	2340
Manganese	SW6010	1.5	mo/kg	SE	SE	450	1210	2,5	633	2040	759
Nickel	S46010	4.0	MQ/kg	SE	2,000	10.8	50.1	30.9	21.2	28.0	19.8
Potassium	SW6010	200	mg/kg	SH	SI	2	1050	1040	7.27	777	363
Sodium	Su6010	5	MO/kg	SH	SX	145	174	248	182	<u>\$</u>	287
Thellies	Su6010	50.0	10/kg	SE	2	9	욮	۽	윺	¥	68.9
Venedium	S46010	4.0	mo/kg	SE	2,400	39.6	8.09	51.1	8.6	86.1	7.08
2 inc	SW6010	2.0	MQ/kg	SH	2,000	26.5	81.0	4.2	52.5	8 53.1.1	53.3
Methylene Chloride	SuB240	0.005	MQ/kg	SN	SN	0.029	0.042	0.00.0	0.020 1	8 0.022 4	0.004 83
Acetone	SH8240	0.010	mg/kg	SE	SH	욮	£	9	0.081	0.063	0.018 8
Toluene	SW6240	0.002	MO/kg	SE	SE	0.048	0.065	0.039	0.026	0.030	0.004
Phenanthrene	SW8270	0.33	mg/kg	SH	SH	9	2	9	0.057	2	æ
Di-n-butylphthelate	SM6270	0.33	mg/kg	SH	SN	0.20	99.0	9 0.65	0.31	0.15	0.26
Fluoranthene	SW8270	0.33	#Q/kg	SX	SE	2	£	윺	0.065	2	윺
Pyrene	SM6270	0.33	mg/kg	SE	SH	9	윺	2	0.057	9	2
bis(2 ethylhexyl)phthalate	SW6270	0.33	mg/kg	SW	S	0.035	0.065	9	0.11	0.45	0.091 8J
MOTES: Results reported for detected analy:	detected		oot v.							;	

e: equipment wash blank f: field replicate R: resample

MOTES: Results reported for detected analytes only.

MI: analyte not tested

MD: analyte not detected.

MD: field blank (ambient condition blank)

MD: analyte not detected.

MD: field blank (ambient condition blank)

MD: field blank (ambient field blank)

MD: field blank field for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

IABLE 4.1.13-3 (continued)

				Standards, Criteria	Criteria	13-C-258 ^R	13-C-25B	13-C-258 ^R	13-C-25B	13-C-258 ^R	13-C-258 ^{fR}
				and Action	and Action Levels (a)	BAFB-0424	BAFB-0254	BAFB-0426	•	BAFB-0427	9
		Detection				7.5-8.0	17.5-19.0	17.5-18.0	27.5-29.0	27.5-28.0	28.0-28.5
Parameter	Method	Limit	Units	Federal	State	01/23/89	12/15/88	01/23/89	12/15/88	01/23/89	01/23/89
Percent Moisture	ASARO	N/A	×	SN	SN	10.9	19.6	22.1	21.0	20.4	13.6
Aluminum	SW6010	20.0	mg/kg	SE	S#	H	13100	H	21500	H	E
Barium	SW6010	10.0	mg/kg	SE	10,000	Ħ	144	Ħ	325	Ī	E
Calcium	Su6010	100	mg/kg	SE	SN	Ħ	0.47	H	4040	=	H
Chromium	SW6010	3.0	2/kg	SX	500	Ħ	36.6	H	8.0%	I	TM.
Cobalt	SW6010	4.0	mo/kg	SN	8,000	H	28.7	H	24.1	H	H
Copper	SW6010	3.0	mg/kg	SZ	2,500	Ħ	2.09	H	43.5	H	H
Iron	SW6010	10.0	mo/kg	N	SN		36200	H	31500	×	T.W
Magnesium	SU6010	90	mo/kg	SN	SN	H	6770	H	2440	H	I R
Manganese	SW6010	1.5	mg/kg	SH	SN	Ħ	1360	Z	1970	Ħ	-
Nickel	SW6010	4.0	mg/kg	SN	2,000	H	28.7	Ħ	43.9	H	H
Potassium	SW6010	500	mg/kg	SN	SN	H	398		823	Ħ	Ħ
Sodium	Su6010	9	mg/kg	SH	S#	¥	353	Z	335	H	H
Thellion	SW6010	20.0	mg/kg	SN	200	H	욮	¥	63.3	H	Ħ
Vanadium	SW6010	0.4	mg/kg	SH	2,400	H	116		77.8	H	Ħ
2 inc	SW6010	2.0	mg/kg	SI	2,000	Ħ	2.99		64.2	H	Ħ
Methylene Chloride	SW8240	0.00	mg/kg	SH	SE		0.00	E E	0.00	₩ 8	Ħ
Acetone	SW8240	0.010	MQ/kg	ST	SN	Ħ	0.027	E E	0.037	₩ 8	H
trans-1,2-Dichloroethene	SW8240	0.002	mg/kg	SH	SW	H	0.005	H	0.014	×	7
Trichloroethene	SW8240	0.002	mg/kg	S#	2,040	H	0.007	LN	0.038	FX.	I.W
Toluene	SW8240	0.005	mg/kg	SE	SW	H	0.021	H	0.028	H	H
Di-n-butylphthalate	SW8270	0.33	mg/kg	SI	S	=	0.41	Z	2	Ħ	H
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	SE	N	=	0.29	TH C	Q	H	Ħ

NOTES: Results reported for detected analytes only.

MT: analyte not tested

MS: analyte not detected.

MS: analyte not detected.

MS: analyte not detected.

MS: analyte not detected.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level currently exists.

MS: No standard criteria or action level cambient condition blank)

MS: No standard is a column confirmation values.

MS: No standard is a column confirmation values.

MS: No standard is a column confirmation values.

MS: No standard is a column confirmation action level. See Appendix I.

MS: No standard is a column confirmation action limits for the State of California Standard of 45 mg/l

MS: resample

MS: No standard is a column confirmation action limits for each analysis are given in Appendix A.

MS: No standard in imits are for dilution action limits. Actual detection limits for each analysis are given in Appendix A.

March Limit Linits Federal State 12/15/88 01/23/89 01/23/89	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	1 1 1 1 1 1 1 1			_	Criteria	13-C-258	13-C-258 ^R	13-C-25B	13-C-258 ^R	13-C-25B	13-C-358
ter Method Limit Units Federal State 12/15/98 01/23/99 12/15/98 01/23/99 12/15/98 12/15/98 12/15/98 01/23/99 12/15/98 <th></th> <th></th> <th>900</th> <th></th> <th>and Action L</th> <th>evels (a)</th> <th>8AFB-0256</th> <th>BAFB-0429</th> <th>BAFB-0257 47-5-49.01</th> <th>6AFB-0430 47.5-48.01</th> <th>8AFB-0258 57.5-59.01</th> <th>8AFB-0246 7.5-9.0</th>			900		and Action L	evels (a)	8AFB-0256	BAFB-0429	BAFB-0257 47-5-49.01	6AFB-0430 47.5-48.01	8AFB-0258 57.5-59.01	8AFB-0246 7.5-9.0
t Moisture ASAMP N/A X NS NS 17.0 23.3 15.4 21.6 18.2 m Saydron Lobo map/kg NS 10,000 98.2 NT 200 NT 1130 m Sakotro 10.0 map/kg NS 10,000 98.2 NT 200 NT 1330 m Sakotro 10.0 map/kg NS 10,000 98.2 NT 200 NT 1330 m Sakotro 10.0 map/kg NS 500 23.7 NT 23.0 NT 1330 m Sakotro 10.0 map/kg NS 2500 23.7 NT 23.0 NT 23.0 m Sakotro 10.0 map/kg NS 2500 27.7 NT 23.0 NT 23.0 m Sakotro 10.0 map/kg NS 2500 27.7 NT 23.0 NT 23.	Parameter	Method	Limit	Units	Federal	State	12/15/88	01/23/89		01/23/89	12/16/88	12/14/88
Sylf71 0.060 mg/kg NS 20 NT 12300 NT 1100 mm Subfolio 0.0 mg/kg NS 10,000 98.2 NT 21300 NT 1100 mm Subfolio 1.0 mg/kg NS 10,000 98.2 NT 27.7 NT 23.0 mm Subfolio 1.0 mg/kg NS 10,000 37.7 NT 27.7 NT 1300 subfolio 4.0 mg/kg NS 2,500 27.7 NT 27.7 NT 1300 subfolio 4.0 mg/kg NS 2,500 27.7 NT 27.7 NT 27.0 subfolio 4.0 mg/kg NS 2,500 24.7 NT 27.0 NT 27.0 subfolio 4.0 mg/kg NS 2,600 24.5 NT 27.0 NT 27.0 subfolio 4.0 mg/kg NS		ASA#O	W/W	×	SZ	SI	17.0	23.3	15.4	21.6	18.2	8.5
March Substitute Substitu		27773	0,00	mo/ko	SZ	20	<u> </u>	2	IN	Q	H	0.24
Substitute Sub		010978	200	o/ko	SI	SN	15200	H	12300	H	11100	619 0
Substitute		Succession 10	10.01	mo/ko	SW	10,000	98.2	H	210	H	133	214
Swedin		Su6010	100	mo/ko	SN	N	3720	H	0777	H	4130	3130
Substitute 4.0 mg/kg NS 2,000 13.3 NT 30.3 NT 18.3 Substitute 4.0 mg/kg NS 2,500 32.7 NT 39.5 NT 2500 substitute 3.0 mg/kg NS 2,500 24.7 NT 2500 NT 2500 substitute 3.0 mg/kg NS 2,000 24.5 NT 2500 NT 2500 substitute 3.0 mg/kg NS 2,000 24.5 NT 27.5 NT 25.0 um 5.0 0.0 2.0 0.0 2.0 0.0 27.1 NT 27.2 NT 27.2 um Substitute 0.0 0.0 2.0 0.0 2.0 NT 0.0 0.0 um Substitute NS 2.0 0.0 2.0 NT 0.0 NT 0.0 um Substitute NS NS <t< th=""><td></td><td>Su6010</td><td>3.0</td><td>mo/ka</td><td>SX</td><td>200</td><td>27.7</td><td>H</td><td>27.7</td><td>T</td><td>35.9</td><td>37.0</td></t<>		Su6010	3.0	mo/ka	SX	200	27.7	H	27.7	T	35.9	37.0
substitute 3.0 32.7 NT 39.5 NT 37.0 substitute 3.0 mg/kg NS 2,500 32.7 NT 39.5 NT 37.0 substitute 3.0 10.0 mg/kg NS 4.0 NS	Cobal t	Su6010	0.4	mo/ko	SE	8,000	13.3	H	30.3	X	18.3	45.2
ium SM6010 10.0 mg/kg NS 26300 NT 26100 NT 25900 NT 2500 NT NT 2500 NT	118000	Su6010	0	o/ko	SE	2,500	32.7	Ħ	39.5	H	37.0	37.7
tiam Subdit 100 maykg NS 4750 NT 5390 NT 6100 eae Subdit 1.5 maykg NS 2,000 24.5 1T 22.5 NT 6100 tiam Subdit 4.0 maykg NS 2,000 24.5 1T 22.5 NT 477 tiam Subdit 2.0 maykg NS 2,000 24.5 NT 167 NT 477 Lam Subdit 4.0 maykg NS 2,00 64.6 NT 70.7 NT 167 Lam Subdit 2.0 70.1 NT 70.0 71.7 NT 47 Lam Subdit 2.0 64.6 NT NT NT NT A7 Lam Subdit 2.0 64.6 NT NT NT NT NT NT Lam Subdit 2.0 64.6 NT NT	1200	Su6010	10.0	p/ko	SE	NS N	26300	Ħ	26100	H	25900	26600
SWAGOTO 1.5 mg/kg NS 2,000 24.5 41 23.5 NT 23.2 time SWAGOTO 4.0 mg/kg NS 2,000 24.5 41 22.5 NT 23.2 time SWAGOTO 200 mg/kg NS 32.3 NT 167 NT 167 um SWAGOTO 4.0 mg/kg NS 2,000 59.4 NT 167 NT 167 um SWAGOTO 4.0 mg/kg NS 2,400 64.6 NT NO NT NT </th <td>Magnes its</td> <td>Su6010</td> <td>100</td> <td>Mo/ko</td> <td>SE</td> <td>S#</td> <td>4750</td> <td>H</td> <td>5390</td> <td>T.X</td> <td>6100</td> <td>2460</td>	Magnes its	Su6010	100	Mo/ko	SE	S#	4750	H	5390	T.X	6100	2460
Subsolio 4.0 mg/kg NS 2,000 24.5 41 22.5 NT 23.2 Lum Subsolio 2.0 mg/kg NS 2,000 24.5 41 22.5 NT 477 Lum Subsolio 2.0 mg/kg NS 2,000 74.1 NT ND NT 167 NT 477 Lum Subsolio 5.0 mg/kg NS 2,000 64.6 NT ND NT 167 NT 167 Lum Subsolio 4.0 mg/kg NS 2,000 64.6 NT <		0105-8	2	p/ka	SE	SH	658	Ħ	1310	Z	3 08	1700
Lum SM6010 200 mg/kg NS 988 NT 508 NT 477 Lum SM6010 100 mg/kg NS 700 74.1 NT 107 NT 167 Lum SM6010 50.0 mg/kg NS 2,400 64.6 NT 70.7 NT ND NT 167 Lum SM6010 4.0 mg/kg NS 2,400 64.6 NT NT ND	zickel	S146010	0.4	mo/ko	SN	2,000	24.5	=	22.5	1 X	23.2	18.6
SM6010 100 mg/kg NS 700 74.1 NT 195 NT 167 SM6010 50.0 mg/kg NS 2,400 64.6 NT 70.7 NT NB SM6010 4.0 mg/kg NS 5,000 59.4 NT 70.7 NT 86.7 SM6010 2.0 mg/kg NS NS NS NT 0.00 NT 0.007 SM6240 0.005 mg/kg NS NS NS NT 0.006 NT 0.007 SM6240 0.005 mg/kg NS NS NS NT 0.006 NT 0.007 SM6240 0.005 mg/kg NS NS NS ND NT 0.006 NT 0.006 SM6240 0.005 mg/kg NS NS NS ND NT 0.006 NT 0.006 SM6240 0.005 mg/kg NS NS <t< th=""><td></td><td>Su6010</td><td>200</td><td>o/ko</td><td>SE</td><td>SN</td><td>986</td><td></td><td>208</td><td>×</td><td>111</td><td>251</td></t<>		Su6010	200	o/ko	SE	SN	986		208	×	111	251
SM6010 50.0 mg/kg NS 700 74.1 NT ND NT ND SM6010 4.0 mg/kg NS 2,400 64.6 NT 70.7 NT 86.7 SM6010 4.0 mg/kg NS 2,400 64.6 NT 70.0 NT 55.3 SM6010 2.0 mg/kg NS NS NS NT 0.008 NT 0.007 SM6240 0.005 mg/kg NS NS NS NT ND NT 0.005 SM6240 0.005 mg/kg NS NS NS ND NT 0.006 NT 0.021 SM6240 0.005 mg/kg NS NS NS ND NT 0.006 NT 0.006 SM6240 0.005 mg/kg NS NS NS ND NT 0.006 NT 0.006 SM6240 0.005 mg/kg NS		SW6010	9	a/ka	N	SN	323	M	ž	174	167	116
SM6010 4.0 mg/kg NS 2,400 64.6 NT 70.7 NT 86.7 SM6010 2.0 mg/kg NS 5,000 59.4 NT 70.7 NT 55.3 SM8240 0.005 mg/kg NS NS NS NT 0.006 NT 0.024 B SM8240 0.005 mg/kg NS NS NS ND NT 0.024 B NT 0.024 NT 0.024 B	The Line	SW6010	50.0	pa/ka	SE	200	74.1	H	윷	H	유	윺
SWEG10 2.0 mg/kg NS 5,000 59.4 NT 52.6 NT 55.3 SWEG10 2.0 mg/kg NS NS NS NT 0.006 B NT 0.007 B NT 0.007 B NT 0.006 NT 0.007 B NT 0.006 NT 0.007 B NT 0.007 NT 0.007 NT 0.007 NT 0.007 NT 0.007 NT 0.006 NT 0.006 NT 0.006 NT 0.007 NT 0.006 NT		Su6010	0.4	po/ko	SE	2,400	\$.6	Ħ	70.7	×	7.98	7.68
SWB240 0.005 mg/kg NS NS 0.016 NT 0.008 NT 0.026 N 0.026 <t< th=""><td>7:00</td><td>Su6010</td><td>2.0</td><td>mo/ko</td><td>SE</td><td>2,000</td><td>29.4</td><td>H</td><td>52.6</td><td>H</td><td>55.3</td><td>7.07</td></t<>	7:00	Su6010	2.0	mo/ko	SE	2,000	29.4	H	52.6	H	55.3	7.07
SWB240 0.010 mg/kg NS NS NT NT ND NT 0.024 B SWB240 0.005 mg/kg NS NS ND NT 0.006 NT 0.21 SWB240 0.005 mg/kg NS 2,040 ND NT 0.006 NT 0.01 swB240 0.005 mg/kg NS NS NS ND NT 0.005 NT 0.005 swB240 0.005 mg/kg NS NS NS ND NT 0.005 NT 0.005 swB240 0.005 mg/kg NS NS NS ND NT 0.005 NT 0.005 swB240 0.005 mg/kg NS NS NS ND NT 0.005 NT 0.005 swB270 0.33 mg/kg NS NS NS NS NS NT 0.24 BJ NT ND e	Methylene Chloride	SU8240	0.005	mo/ka	S#	SH	0.010	8 H	0.008	E E	0.007	0.048 8
Dichloroethene SWB240 0.005 mg/kg NS NS ND NT 0.006 NT 0.21 there SWB240 0.005 mg/kg NS 2,040 ND NT 0.006 NT 0.006 thoroethene SWB240 0.005 mg/kg NS NS ND NT 0.005 NT 0.006 oethene SWB240 0.005 mg/kg NS NS ND NT 0.005 NT 0.004 J oethene SWB240 0.005 mg/kg NS NS ND NT ND NT 0.004 J substance SWB240 0.005 mg/kg NS NS ND NT ND NT 0.004 J phthalate SMB270 0.33 mg/kg NS NS ND NT ND NT 0.24 BJ phthalate SMB270 0.33 mg/kg NS NS <td>Acatona Circii Con</td> <td>S148240</td> <td>0.010</td> <td>mo/ko</td> <td>SE</td> <td>SE</td> <td>0.014</td> <td>E S</td> <td>2</td> <td>H</td> <td>0.054</td> <td>3 0.005 BJ</td>	Acatona Circii Con	S148240	0.010	mo/ko	SE	SE	0.014	E S	2	H	0.054	3 0.005 BJ
charte SuB240 0.005 mg/kg NS 2,040 ND NT 0.045 NT 0.021 charte SuB240 0.005 mg/kg NS Location NT 0.045 NT 0.021 nicroethare SuB240 0.005 mg/kg NS NS ND NT 0.005 NT 0.062 nethere SuB240 0.005 mg/kg NS NS ND NT ND NT 0.042 suB270 0.33 mg/kg NS NS NS NS NT ND NT ND hhtmate SuB270 0.33 mg/kg NS	rene-1 2-Dichloroethene	S148240	0.005	mo/ko	NS	SR	Ş	E	90.0	12	0.21	욮
there Su8240 0.005 mg/kg NS 2,040 ND NT 0.045 NT 0.21 hicroethare Su8240 0.005 mg/kg NS NS ND NT 0.009 NT 0.062 cethere Su8240 0.005 mg/kg NS NS ND NT ND NT 0.004 J Su8240 0.005 mg/kg NS NS ND NT ND NT ND NT 0.042 phthalate Su8270 0.33 mg/kg NS NS NS ND NT ND ND NT ND N		SH8240	0.005	mo/ko	SI	SN	2	H	욮	Ħ	90.0	2
ne SMBZ40 0.005 ng/kg NS NS ND NT ND NT 0.004 J SMBZ40 0.005 ng/kg NS NS ND NT ND NT 0.004 J SMBZ70 0.33 ng/kg NS NS NS ND NT ND NT ND that are SMBZ70 0.33 ng/kg NS NS NS NT 1.5 NT 0.24 BJ that are SMBZ70 0.33 ng/kg NS NS ND NT 0.24 BJ NT ND	Trichlorosthane	S148240	0.005	mo/kg	SN	2,040	2	×	0.045	-	0.21	윺
SMB240 0.005 mg/kg NS NS ND NT ND NT 0.004 J SMB240 0.005 mg/kg NS NS ND NT ND NT ND NT ND SMB270 0.33 mg/kg NS NS ND NT ND NT ND NT ND SMB270 0.33 mg/kg NS NS 0.29 J NT 1.5 NT 0.24 BJ	1 1 2-Trichlocoethane	SUB240	0.005	ma/ka	SE	SH.	⊋		0.00	Ξ	0.062	윺
SUB240 0.005 mg/kg NS NS ND NT ND NT ND NT ND SUB270 0.33 mg/kg NS NS ND NT ND NT ND NT ND NT ND NT ND SUB270 0.33 mg/kg NS NS 0.29 J NT 1.5 NT 0.24 BJ the attention of the subsection of the s	Tetrachloroethene	SW8240	0.005	ma/ka	SH	SN	9	H	2	1	0.004	<u> </u>
SWB270 0.33 mg/kg NS NS ND NT ND NT ND C.24 BJ the ate SWB270 0.33 mg/kg NS NS 0.29 J NT 1.5 NT 0.24 BJ the ate SWB270 0.33 mg/kg NS NS ND NT 0.24 BJ NT ND	Toluene	SUB240	0.00	ma/kg	SE	SN	₽	H	욡	Ħ	0.042	0.020
the at 848270 0.33 mg/kg NS NS 0.29 J NT 1.5 NT 0.24 BJ Khalate 848270 0.33 mg/kg NS NS ND NT 0.24 BJ NT ND	Phenol	SW8270	0.33	mo/ko	SE	SH	2	-	₽	Ī	욮	0.83 8
thatate SW8270 0.33 mg/kg NS NS ND NT 0.24 BJ NT ND	Di-o-butvichthalate	Su6270	0.33	mg/kg	SN	SE	0.29	F F	1.5	H	0.24	9
	bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	KS	HS	Ş	H	0.54	P3	₹	0.23 87

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. MT: analyte not lested MD: analyte not detected.

MS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix 1.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 for Nitrate + Mitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

e: equipment wash blank f: field replicate R: resemple

TABLE 4.1.13-3 (continued)

				Standards, Criteria and Action Levels (a)	Criteria Levels (a)		13-C-358 BAFB-0248	13-C-358" BAFB-0431	13-C-3SB BAFB-0249	13-C-358 BAFB-0432	13-C-358 th BAFB-0433
Parameter	Method	Detection Limit	Units	Federal	State	17.5-19.0° 12/14/88	27.5-29.0° 12/15/88	27.5-28.0° 01/24/89	37.5-39.0° 12/15/88	37.5-38.0° 01/24/89	38.0-38.5° 01/24/89
Percent Moisture	ASARO	A/N	×	SN	SW	21.2		22.5	20.6	26.8	22.3
Mercury	SW7471	0.060	mg/kg	SZ	50	0.11		Q	2	2	9
Atualous	SW6010	20.0	mg/kg	SE	SH	18000	-	LW.	13700	×	R
	Su6010	10.0	mg/kg	SI	10,000	84.3	308	H	85.3	M	Ŧ
Calcius	Stu6010	100	mg/kg	SW	SM	0259		H	3940	Ħ	H
Chromium	SW6010	3.0	mo/kg	SN	500	52.2		IN	28.6	H	H
Cobalt	SW6010	4.0	mg/kg	SW	8,000	20.3		H	12.5	H	7
Copper	SW6010	3.0	mo/kg	SW	2,500	61.9		H	33.8	X	Ħ
5	SW6010	10.0	10/kg	SN	SR	38700		H	26400	H	H
Magnesium	SW6010	5	mg/kg	SN	SN	8350		H	4740	H	×
Manganese	SW6010	1.5	mg/kg	SR	SN	514		H	451	H	I
Nicket	SW6010	4.0	mg/kg	SX	2,000	27.7		H	25.2	H	H
Potassium	SW6010	200	mg/kg	SM	SN	777		×	899	H	Ħ
Sodium	SW6010	<u>5</u>	a/kg	N	SN	526		H	315	Ħ	=
Vanedium	SW6010	4.0	mg/kg	SN	2,400	101		IN.	60.1	H	H
Zinc	Sw6010	2.0	mg/kg	SM	2,000	74.0		H	55.9	IN	H
Chloromethane	SW8240	0.010	mg/kg	SW	SN	9	_	- X	2	H	E
Methylene Chloride	SW8240	0.002	MQ/kg	SN	SE	0.062	_	L K	0.00	J. HT	H
Acetone	SW8240	0.010	mg/kg	SN	SE	0.008	_	E E	0.016	B MT	=
Chloroform	SMB240	0.002	MQ/kg	SN	SH	₽	_	THE T	0.006	H	=
Toluene	SW8240	0.005	mg/kg	SN	S	0.005	_	H	0.031	H	12
Phenol	SW8270	0.33	mg/kg	N	SE	0.86		H	읒	H	Ħ
Di-n-butylphthalate	SW8270	0.33	mo/kg	N	SE	9		H	0.91	H	Ħ
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	W	SH	0.30		BJ NT	윷	Ħ	H

WOTES: Results reported for detected analytes only.

WI: analyte not tested

WI: analyte not tested

WI: analyte not tested

WI: analyte not detected.

WI: analyte not detected in limit for action level currently exists.

WI: analyte not detected.

WI: analyte not detected in blank

WI: analyte not detected.

WI: analyte not detected in blank

WI: analyte not detected in blank

WI: analyte not detected in blank

WI: analyte not detected.

WI: analyte not detected in blank

WI: field replicate

WI: resample

				Standards,	Criteria	13-C-3SB	13-C-358 ^R	13-C-3SB	13-C-358 ^R	13-C-458	
				and Action	Levels (a)	BAFB-0250	BAFB-0434	BAFB-0251	BAFB-0435	BAFB-0303	8
		Detection				47.5-49.0	47.5-48.01	57.5-59.0	57.5-58.0	7.5-9.0	
Parameter	Method	Limit	Units	Federal	State	12/15/88	01/25/89	12/15/88	01/25/89	01/04/89	
Percent Moisture	ASALFO	Y/N	×	SN	SN	15.4	21.7	23.3	19.2	17.5	19.8
Aluminum	Sw6010	20.0	mg/kg	SH	SH	19500	H	22900	H	15600	13700
Barium	Stu6 010	10.0	mg/kg	SN	10,000	3 5	H	88.0	H	546	78. 1.50
Beryllium	SN6 010	0.50	mg/kg	SH	ĸ	2	H	0.65	H	2	9
Calcium	Su6010	5	mg/kg	SE	SN	2650	H	7420	H	4020	512
Chromium	SW6 010	3.0	mo/kg	SE	200	8.67	Ħ	40.2	H	29.0	38.5
Cobelt	SW6010	0.4	MQ/kg	S¥	8,000	21.3	H	16.9	H	15.8	21.2
Copper	SW6010	3.0	mg/kg	SI	2,500	9.45	Ħ	59.3	H	39.5	55.5
Iron	Stu6 010	10.0	MO/kg	SN	SE	37600	Ħ	35700	H	26400	32900
Magnesium	Stu6 010	5	mo/kg	SE	SH	2002	H	9230	H	6580	7380
Manganese	Stu6.010	1.5	10/kg	SE	SH	923	¥	286	H	515	256
#ickel	Succo10	4.0	mg/kg	SR	2,000	56.6	H	28.0	H	K.	23.7
Potassium	SW6010	0 2	m 0/kg	SE	SH	615	H	736	Ħ	521	677
Sodium	Stu6.010	5	MO/kg	SE	SZ	235	H	273	H	342	787
Vanadium	Sta6010	4.0	mg/kg	SE	2,400	103	Ħ	63.2	Ħ	67.3	5
2inc	SW6010	2.0	mg/kg	SZ	2,000	65.0	H	80.5	H	52.8	66.5
Methylene Chloride	SW6240	0.00	m 0/kg	SH	SH	0.006	H	0.007	B H	0.067	0.091
Acetone	SW8240	0.010	mo/kg	SA	HS	0.022	F#	0.044	F# 8	2	0.019
2-Butanone	SW6240	0.010	mg/kg	SE	SE	윺	Ħ	0.014	B NT	2	3
Trichloroethene	SW6240	0.00	20/kg	SH	2,040	0.005	×	₽	Z	2	욮
Toluene	SMB240	0.00	mo/kg	SH	SI	0.021	Ħ	0.008	Ħ	윺	0.001
0i-n-butylphthalate	SM6270	0.33	mg/kg	SX	SN	0.71	E	0.27	L .	0.11	30 0.25 BJ
bis(2-ethylhexyl)phthalate	SM6270	0.33	10 /kg	SE SE	SE	0.21	- FR	0.21	BJ NT	0.11	3J 0.12 BJ

MT: analyte not tested

J: estimated value, below quantification limit f: field replicate

MS: No standard criteria or action level currently exists.

(): values represent most stringent standard, criteria or action level. See Appendix I.

**The federal standard for Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l NOTES: Results reported for detected analytes only.

e: equipment wash blank f: field replicate R: resample

for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.13-3 (continued)

				Standards,	Criteria	13-C-458	13-C-4SB	13-C-45B	13-C-458	13-C-558	13-C-558 BAFB-0287
		Detection		AND ACTION	Tevels (a)	27.5-29.0°	37.5-39.0°	47.5-49.0	57.5-59.0	7.5-9.0	17.5-19.0
Parameter	Method	Limit	Units	Federal	State	01/04/89	01/04/89	01/04/89	01/04/89	12/16/88	12/16/88
Derries Woletine	ASAMO	W/A	×	SE	S	23.7	22.7	22.4	20.7	10.5	12
Alution	010778	20,0	mo/ka	S	SE	20200	28500	15100	19300	5850	390 2
Perfe	010342	10.0	ø/ka	SH	10,000	3 6%	131	281	107	72.4	45.3
Beryl in	516010	0.50	mo/kg	SE	K	2	R	0.77	2	3	2
Coloin	010975	9	mo/ka	S	SE	6280	2960	5720	5130	1830	3380
Chronium	0103418	3.0	mo/ko	S	200	49.5	35.2	49.1	35.1	22.3	20.3
Cobelt	Su6010	0.4	go/ko	SH	8,000	28.7	15.5	7.92	16.4	14.5	7.1
Jean	010348	3.0	p/ka	X.	2,500	20.5	63.3	4.K	4.74	24.5	39.6
1.00	010348	10.0	ø/ko	S	SE	39400	38000	36100	31500	15200	18100
Magnetical	SUK010	90	Mo/ko	SE	SE	11400	7630	10200	0009	2670	%
Mandahasa	010373	5.5	e /ko	S	SE	10,00	485	876	620	532	213
	010978	7	mo/ka	S	2,000	44.4	3.95	30.4	21.4	12.3	12.0
Potential and	SUKOJO	200	a/ka	S	S	280	1220	295	424	2	£
Sodia	Su6010	9	mo/ka	S	SE	272	505	211	198	191	112
The! ice	5146010	20.0	Mo/ko	SE	200	2	፩	물	69.1	9	윭
- Sandi	SUK010	0.4	mo/ko	S	2.400	9.06	4.6	121	76.0	56.8	65.8
Zioc	Su6010	2.0	ay/ka	S	2,000	82.3	88.7	85.2	62.5	23.9	45.3
Mathylane Chloride	S4000	0.005	ø/ka	S	ST	0.073	0.10	0.026	0.026	9	0.005
Acetone	Su6240	0.010	mg/kg	SE	SE	0.013	0.014	0.00	J 0.006 J	0.00	0.014 8
Tolivene	SU0240	0.005	me/ka	¥	SZ	0.003	0.003	0.021	0.003	0.007	0.034
Di-n-butylchthelate	Su6270	0.33	mo/kg	SE	SE	0.31	. 0.25	Z 0.3	8 0.588	0.13	0.43
bis(2-ethylhexyl)phthalate	SW6270	0.33	30/kg	ST	SZ	0.13	31 0.12	31 0.12	BJ 0.11 B	0.099	10 0.15 BJ
											,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

e: equipment wash blank f: field replicate R: resample 8: analyte detected in blank 1: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.
NT: analyte not tested
ND: analyte not detected.
NS: No standard criteria or action level currently exists.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. (): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

TABLE 4.1.13-3 (continued)

				Standards, Cri	iteria	13-C-558	13-C-558	13-C-5SB	13-C-558 ^K	13-C-5SB	
		•		and Action Lev	Levels (a)	BAF8-0288	BAFB-0289	BAFB-0290	BAFB-0534	BAFB-0291	
Parameter	Method	Detection Limit	Units	Federal	State	27.5-29.0' 12/16/88	37.5-39.0 12/16/88	47.5-49.0° 12/19/88	47.0-48.5 05/02/89	57.5-59.0 ¹ 12/19/88	
Percent Moisture	ASANO	N/A	×	SN	SN	18.7	23.3	25.8	=	18.1	
TFM-Gas	TFR-G	S	mo/ko	W.	SH	2	2	욮	2	2	
Atuminum	State 010	20.0	MO/kg	SE	SH	14400	11600	17800	Ħ	12600	
	Suco10	10.0	mo/kg	SE	10,000	161	5	117		436	
Beryllia	Sw6010	0.50	Mo/kg	SE	ĸ	9	윤	2	T	5.0	
Calcium	Su6010	5	mo/ko	SH	SE	4020	2950	4270	7	4520	
Chromium	Su6010	3.0	MQ/kg	SN	8	35.9	14.3	25.6	TH	44.2	
Cobalt	Su6010	4.0	MO/kg	SE	8,000	17.2	9.6	17.5	H	51.8	
Copper	Su6010	3.0	mo/kg	SE	2,500	36.4	22.2	40.3	Ħ	54.0	
i e i	St.6010	10.0	Ma/kg	SH	SE	27300	16900	25300	×	32500	
Hagnesium	Su6010	5	20/kg	SH	Ş	5830	3340	6190	H	7520	
Hanganese	Su6010	1.5	mo/kg	SH	SE	28	481	613	H	2030	
Wicket	Sta6010	4.0	MQ/kg	SH	5,000 2,000	8.62	50.9	30.6	H	3.8 8.8	
Potassium	Su6010	20	MQ/kg	S	SE	910	1280	633	Ħ	525	
Sodius	Su6010	5	mo/kg	S	SE	564	322	288	H	192	
Vanadium	Sta6010	4.0	mo/kg	SH	2,400	60.5	43.5	49.5	H	139	
2inc	Su6010	2.0	mg/kg	SI	2,000	72.8	49.3	57.8	TN	9.69	
Methylene Chloride	SuB240	0.005	MQ/kg	SH	SE	2	욯	Ħ	H	9000	
Acetone	\$1,6 240	0.010	mo/kg	SI	SZ	0.014	0.014		H	2	
2-Butanone	S46240	0.010	mg/kg	S#	SZ	2	0.008	F# 1	R	2	
Trichloroethene	SMB240	0.002	MQ/kg	S#	2,040	2	2	H	Ħ	90.0	
Toluene	SMB240	0.00	20/kg	SH	SE	0.062	0.053	Ħ	H	0.034	
Di-n-butylphthalate	SW6270	0.33	mo/kg	SH	SE	2	0.23		2	5.4	
Butylbenzylphthalate	SW8270	0.33	MQ/kg	SE	SE	2	2	Ħ	2	0.54	
bis(2-ethylhexyl)phthalate	SM6270	0.33	mg/kg	SH	Ş	9	0.18	- N	0.063	J 0.57 B	

WI: analyte not tested

WI: analyte not detected.

WI: analyte not detected in blank

WI: analyte not detected in limits are for detection limits. Actual detection limits for each analysis are given in Appendix A. NOTES: Results reported for detected analytes only.

TABLE 4.1.13-3

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 13

				Standards, Criteria and Action Levels (Criteria Levels (a)	13-C-1GW	13-C-2GW	13-C-2GW ^R		13-C-4GH	13-C-5GN
Parameter	Method	Detection Limit	units	Federal	State	BAFB-0467 02/28/89	BAFB-0501 03/21/89	BAFB-0529 04/19/89	BAFB-0500 03/20/89	BAFB-0459 02/13/89	BAFB-0470 03/01/89
Specific Conductivity	E120.1	1.0	Carlos/CB	SH	8	413		300	240	370	420
Temperature	E170.1	K/N	deg C	SH	SH	16.5	18.5	20.0	18.9	19.0	18.0
₹.	E150.1	4/ 8	ā	2-9	SH	6.73		7.07	6.97	6.72	98.9
Alkalinity - Total	SPK 03	1.0	7	2	SN	106.8		Ħ	141.2	137.0	128.4
Bicarbonate	SH403	1.0	7	SE	SH	130.3	•	Ħ	172.3	167.1	156.6
Total Dissolved Solids	E160.1	3.0	1	200	200	353		Ħ	318	313	365
Chloride	£325.3	1.0	/	250	250	0.67		H	50.5	34.6	0.95
Fluoride	E340.2	0.050	7	~	1.4	0.15		Ħ	0.22	0.14	0.14
Mitrate + Mitrite	E353.3	0.050	7/0	10	45	25.5		I	6.8	12.9	25.2
Sulfate	E375.4	1.0	1/02	250	220	20.8		Ħ	15.6	11.6	27.3
Mercury	SU7471	0.0050	1/9	.002	.002	2		H	윷	2	0.00080
Calcium	SW6010	1.8	7/02	SE	SZ	36.3		H	¥.6	8.62	39.9
Magnesium	Sta6010	.	7	SZ	SE	24.7		H	24.5	21.2	27.1
Hangahese	Sta6010	0.0150	1/2	.0s	9	3		H	9	윤	0.0220
Potassium	Sta6010		7/2	SH	SH	2		H	욮	1.8	1.20
Sodium	Stu6010	2.0	/2	SH	SH	14.9		H	15.9	15.4	15.8
2 inc	SW6010	0.0200	7	0.110	0.012	0.0360		Ħ	0.0360	0.138	윺
trans-1,2,-Dichloroethene	SLIB 010	-	7/35	SE	SE	160(21)	2	Ħ	웊	윺	욮
Chloroform	SUB 010	-	- - -	SZ	10	2(2)	욮	H	윺	윺	욮
Trichloroethene	su8010	-	- P	S	8	1500(1200	~	Ħ	30(28)	30(26)	18(20)
1,1,2-Trichloroethane	State 010	-	7/85	SH	32	20(13)	£	H	욯	욮	2
Tetrachloroethene	SUB010	-	7/27	2000	'n	28(12)	⊋	Ħ	9	윷	9
Toluene	SIMB020	-	7/87	14,300	5	2	웊	Ħ	£	11(15)	윺
M-Witrosodiphenylamine (1)	SMB270	2	7/85	SZ	SE	2	Ħ	m	BJ #1	윺	윺
bis(2-Ethylhexyl)Phthalate	SM8270	5	765	S	SH	욮	Ħ	<u>~</u>	BJ NT	60	9
a bather and the bather as the second	- detection	Vice setvices	> 5								

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) MS: No standard criteria or action level currently exists. (): values listed in () are 2nd column confirmation values. WOTES: Results reported for detected analytes only. MI: analyte not tested WD: analyte not detected.

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

				Standards, Cand Action L	Criteria Levels (a)	13-A-1GW	13-A-1GW ^R		13-A-2GW ^R	
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0503 03/22/89	BAFB-0531 04/20/89	BAFB-0502 03/22/89	BAFB-0530 04/18/89	BAFB-0461 02/13/89
Specific Conductivity	F120.1	1.0		SM	006	009	525		062	170
Temperature	E170.1	Y/R	Obo C	S	SE	19.1	20.0	19.5	20.5	17.0
7	£150.1	¥/¥	7	2-6	SE	7.00	7	71.7	6.97	7.85
Alkalinity - Total	SP4.03	1.0	1/04	50	SE	143.2	ż	104.2		54.0
Bicarbonate	S#403	1.0	7	S	SN	174.7	I	127.1	H	65.9
Total Dissolved Solids	E160.1	3.0	1/0	200	200	349	H	288	H	169
Chloride	E325.3	0.	1/04	250	250	63.5	Ħ	48.5	*	21.4
fluoride	E340.2	0.050	1/0	~	1.4	0.20	T.N	0.23	E	0.16
Nitrate + Mitrite	E353.3	0.050	1/01	5	45	8.8	H	5.0	H	12.6
Sulfate	E375.4	1.0	7	220	250	11.5	H	14.2	H	15.4
Chemical Oxygen Demand (COD)	E410.4	7.0	7	SH	SE	₽	Ħ	2	×	19.7
Lead	S47421	0.0050	7	5	5	¥	F	욯	FR	0.0050
Calcium	Su6010	1.8	1/0	SN	SN	42.3	H	31.7	T.W	12.3
Iran	St.6010	0.100	7	ĸ.	m.	2	IN	9	Ħ	0.161
Magnesium	SH6010	9.1	<u> </u>	SH	SN	28.3	H	21.9	Ħ	8.04
Potassium	S46010	1.00	\	SN	SE	1.20	H	€	IN	3.20
Sodiu	SW6010	. 8.	1/01	SE	SE	16.7	H	14.7	=	21.1
Zinc	S46010	0.0200	7/0	0.110	0.012	0.0500	¥	0.0230	H	0.0290
Trichloroethene	Su 8 010	-	1/85	50	S	9	Ħ	4(2)		2
M-Nitrosodiphenylamine (1)	Su8270	5	1/65	SN	SE	Ħ	-	TN C	ĸ	8. NO
Di-n-Butylphthelate	SW8270	2	7/85	SE	SX	Ħ	¥	H	4	ST FE
his (2-Ethvihexvi)Phthalate	SW8270	2	7	SZ	SZ	H	-	H	4	9

WOTES: Results reported for detected analytes only.

WI: analyte not tested
WD: analyte not detected.
WD: detected in blank
WD: analyte not detected not limits are for dilution analyte analysis are given in Appendix A.
WD: analyte not detected not limits are for dilution analysis are given in Appendix A.
WD: analyte not detected not limits are for dilution analysis are given in Appendix A.

TABLE 4.1.13-3

BEALE AFB: WATER DATA ZND ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 13

Detection Dete	ion Units		1		13-C-1GF	13-C-16F	13-0-104	13-C-26N	13-C-3GU
E120.1 1.0 L E170.1 N/A E150.1 N/A SM403 1.0 SM403 1.0 E160.1 3.0 E35.3 1.0 E35.3 0.050 E353.3 0.050		Federal	State	BAFB-0568 06/02/89	BAFB-0570 06/02/89	BAFB-0567 06/02/89	8AFB-0569 06/02/89	BAFB-0562 06/01/89	BAFB-0564 06/01/89
E170.1 N/A E150.1 N/A SM403 1.0 SM403 1.0 E160.1 3.0 E325.3 1.0 E340.2 0.050 E353.3 0.050 E355.4 1.0	Curros/cm	SE	8	i	380	H	=	313	607
84403 1.0 84403 1.0 84403 1.0 E160.1 3.0 E325.3 1.0 E340.2 0.050 E353.3 0.050 E355.4 1.0	c deg C	SH	SE		19.5	H	H	19.0	19.5
#403 #403 #160.1 #325.3 #340.2 #353.3 #355.4		2-9	SH		7.6	H	Ħ	7.08	6.78
##03 E160.1 E325.3 E340.2 E353.3 E355.4	7	2	SH	115.4	115.2		H	330.8	139.8
E160.1 E35.3 E35.3 E353.3 E355.4	<u></u>	SE	SE		140.5		H	403.6	170.6
635.3 636.2 6353.3 6375.4	7	200	200		458	10.0	H	320	393
E340.2 () • Mitrite E353.3 () • E375.4	7	520	250		61.7		Ħ	31.3	51.7
+ Nitrite E353.3 (E375.4 E46010	1	7	1.4		0.13		Ħ	0.19	0.13
E375.4	700	10	45		33.2		TN	24.5	7.5
CLACO 10	700	250	220		38.8		H	14.4	18.1
200	7	SE	SN		36.6		H	25.7	7.78
Su6010	7	SZ	SN		25.5	₽	H	17.5	23.7
m Su6010	Š	S#	SN		1.10	웊	H	2	1.40
		S¥	SE		15.4		¥	13.2	16.5
SH6010 0.		0.110	0.012		윺		Ħ	0.0310	욽
1-1,2,-Dichloroethene	7	SH	SN		94(13)	3	₽	2	4
	765	SH	5		£		3(4)	2	2
thene) 9	~	S		1000(830)		2	8(10)	69(62)
ethane	797	SH	32		21(17)		욮	₩	2
	7/95	2000	Ś		16(15)		2	2	2(2)
Toluene sw8020 1	7	14,300	<u>5</u>		4	2(1)	2(3)	2	2
N-Hitrogodiphenylamine (1) SW6270 10	\ \	S	S#		•		B. N.	'	. 5
	1/87	SH	SH		2		¥	7	7

NOTES: Results reported for detected analytes only.

e: equipment wash blank f: field replicate R: resample

MI: analyte not tested

MI: analyte not detected in blank

MI: analyte not detected.

MI: analyte not detected.

MI: analyte not detected.

MI: analyte not detected in blank

MI: field blank (ambient condition blank)

MI: resample

M

				Standards, and Action	Criteria Levels (a)	13-C-464	13-C-5GV	13-A-1GH	13-A-2GH	13-c-15u	13-C-154
		Detectio	_			BAFB-0561	BAFB-0566	BAFB-0563	BAFB-0565	BAFB-0590	BAFB-0591
Parameter	Method	Limit	Units	Federal	State	06/01/89	06/02/89	06/01/89	06/01/89	06/12/89	06/12/89
Specific Conductivity	E120.1	1.0	umpos/cm	SN	8	357	007	710	338	650	:
Temperature	E170.1	4/8	deg c	S	NS	19.5	19.0	19.0	19.0	29.0	
***	E150.1	*	Ŧ	2-9	S#	6.97	6.97	7.20	7.01	8.66	
Alkalinity - Total	SHK 03	1.0	7/01	2	S#	148.2	149.2	169.6	126.0	59.5	0.99
Bicarbonate	\$14 603	1.0	ž	SH	SH	180.8	182.0	206.9	153.7	72.2	
Total Dissolved Solids	E160.1	3.0	7/02	200	200	344	514	28	366	427	
Chloride	E325.3	1.0	/	220	220	34.8	48.5	129	41.8	71.8	
Fluoride	E340.2	0.020	7	~	1.4	0.12	0.00	0.11	0.14	0.17	
Mitrate + Mitrite	£353.3	0.020	Ž	-0 -0	59	10.9	26.7	7.2	6.1	74.0	
Sulfate	E375.4	1.0	7	220	5 20	12.6	71.0	7.6	30.9	48.7	
Chemical Oxygen Demand (COD)	E410.4	7.0	>	SX	SR	윺	2	9	2	56.3	
Calcium	Su6010	1.00	7	Ş	SW	59.9	7.7	58.9	31.1	22.0	
Iron	Su6010	0.10 00.10	<u> </u>	ĸ.	ĸ.	2	2	2	9	0.113	
Magnesium	Su6010	1.8	1/01	SI	SN	20.5	21.7	38.9	50.9	12.0	
Manganese	Su6010	0.0150	7/8	ક	s.	욮	0.456	윺	2	2	
Potassium	Su6010	8	7/0	Ş	SN	1.1	1.30	1.50	1.3	10.6	
Sodius	SW6010	. 8.	7/02	Ş	SE	14.5	47.9	21.1	16.8	2.5	
Zinc	Su6010	0.0500	7/01	0.110	0.012	윺	2	2	2	0.0610	
Trichloroethene	SL/8010	_	7/80	٠	'n	37(28)	12(14)	11(11)	33(36)	2	
1,1,2,2-Tetrachloroethane	Su 5 010	-	7	S X	_	_	2	2	9	2	
Toluene	SMB020	-	7/60	14,300	5	2	¥	2	~	-	
1,2-Dichlorobenzene	SL6270	2	7/80	950	130	₽	2	2	Q	m	
N-Witrosodiphenylamine (1)	SUB270	2	1/85	S	SN	7 5	_ _ _	3.	4	80	8. 7 8.
bis(2-Ethylhexyl)Phthalate	SUB270	2	7/ 6 0	SN	SH	2	€	'n	•	e e	2 J

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NT: analyte not tested ND: analyte not detected. NS: No standard criteria or action level currently exists. WOTES: Results reported for detected analytes only.

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.13-3 (continued)

				Standards, and Action	Standards, Criteria and Action Levels (a)	13-C-15V	13-C-15t 13-C-15th	
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0592 BAFB-0593 06/12/89 06/12/89	AFB-0592 BAFB-0593 06/12/89 06/12/89	
Mitrate + Mitrite E353.3 Chemical Oxygen Demand (CCD) E410.4	E353.3 E410.4	0.050	7	±0± ≥×	45 NS	0.51 9.0	E 12	
Methylene chloride N-Nitrosodiphenylamine (1) Di-n-Butylphthalate	SLB 270 SLB 270 SLB 270	~ 5 5	777	2	2 2 2 2 2 3	130(110) 1 6 BJ 3 J	170(160) NT NT	
NOTES: Results reported for detected analytes only. WT: analyte not tested	detected	analytes o	nty.	en ·	B: analyte detected in blank	cted in bla		e: equipment wash blank
ND: analyte not detected. NS: No standard criteria or action level	ection le	wel curren	currently exists.		estimated va field blank	lue, below (J: estimated value, below quantification timit b: field blank (ambient condition blank)	R: resample
(): values listed in () are 2nd column confirmation values. a: Values represent most atringent atandard, criteria or action level. See Appendix I. * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l	ingent st litrate +	andard, cr Witrite is	confirmation values. Mard, criteria or act crite is given as 10	re. action leve 10 mg/l as	st. See Appe Nitrogen whi	ndix I. ch is equal	to the State of Cali	ornia Standard of 45 mg/l
for Mitrate + Mitrite given as Mitrate Detection limits are for dilution = 1.0	on as Mitr Lution = 1	ete. 1.0 and rep	resent tar	pet detecti	ion limits. A	ctuel detec	tion limits for each	for Mitrate + Mitrite given as Mitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.13-3

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 13

				Standards,	Criteria	13-C-16U	14-F-200	13-C-100	14-7-71	11-7-56	13-7-7-1
		Detection	-	5 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	•	BAFB-0665	BAFB-0664	BAFB-0663	BAFB-0659	BAFB-0657	BAFB-0662
Perameter	Method	Limit	Units	Federal	State	09/21/89	09/21/89	09/50/89	09/19/89	09/19/89	09/20/89
Specific Conductivity	E120.1	0.	umpos/cm	Ş	8	077	310	415	350	977	140
Temperature	E170.1	4/	O GOO	SE	SE	19.8	19.0	19.0	19.0	19.0	19.9
7	E150.1	4/ 1	**	2-9	SH	7.02	7.10	7.09	7.05	7.17	7.33
Alkalinity - Total	SP# 603	1.0	7	2	SZ	114.8	102.0	139.0	138.0	141.0	73.6
Bicarbonate	S# 403	1.0	7	SE	SH	140.1	124.4	169.6	168.4	172.0	89.8
Total Dissolved Solids	E160.1	3.0	Ž	200	200	545	387	385	354	417	146
Chloride	E325.3	1.0	7	220	250	65.0	33.0	0.09	35.0	0.94	0.4
Fluoride	E340.2	0.020	Ž	7	1.4	0.13	0.19	0.16	0.13	0.12	97.0
Mitrate + Mitrite	E353.3	0.020	7	ē	45	31.3	23.6	8.6	12.0	297	5.3
Sulfate	E375.4	1.0	1/0	220	220	26.0	14.0	15.0	13.0	37.0	3.5
Calcium	Su6010	9.1	ì	SE	SE	39.0	25.3	36.9	31.2	37.6	10.3
Lo.	Su6010	0.100	7	'n.	ĸ.	2	웆	0.159	ş	2	2
Negnes i un	Su6010	9.5	7	SE	SH	27.0	17.2	25.0	21.3	23.5	7.03
Nanganese	Su6010	0.0150	7	ę.		윺	윺	욮	유	0.436	0.0150
Potassium	Su6010	5.	7	SE	SE	윺	2	웆	₽	욮	÷.8
Sodius	Su6010	 8.	1 / 2	SN	SE	15.6	12.5	16.4	14.6	56.4	10.7
Zinc	SIM6010	0.0500	7	0.110	0.012	2	윺	욮	욮	욮	0.0210
trans-1.2Dichloroethene	Su 6 010	_	7/8	SH	S	윺	2	(4)9	₽	욮	₽
Trichloroethene	SUB 010	-	7/80	S	'n	2	10(7)	99(82)	62(50)	14(17)	(9)9
Tetrachloroethene	su6 010	-	1/80	2000	~	₽	2	6(3)	4(2)	3	2
Toluene	SUB020	-	1/80	14,300	5	₽	2(0)	1(0)	2	3	9
Diethylphthalate	SM6270	2	7	SE	SE	a	윺	욡	=	2	2
M-Witrosodiphenylamine (1)	Su6270	2	7	SE	SH	₽	•	_	♀	•	79
bis(2-Ethylhexyl)Phthalate	SM8270	2	1/80	S	SE	윺	욮	욮	2	9	78 6

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only. WI: analyte not tested ND: analyte not detected.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values. NS: No standard criteria or action level currently exists.

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Witrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.13 (continued)

				Standards, Candards, Candards	Criteria Levels (a)	13-A-1GH	13-A-26W	13-c-15W	08-C-3GN	W5-2-80	757-J-80
Parameter	Method	Detection Limit	n Units	Federal	State	BAFB-0661 09/20/89	BAFB-0660 09/20/89	BAFB-0666 09/21/89	8AFB-06/2 09/26/89	BAFB-06/4 09/26/89	09/26/89
Specific Cooperations	£120.1	1.0	ratios/ca	SX	8	510	320	432	=	Ħ	H
Tomocatino	£170.1	W/#	0	S N	SH	18.0	17.8	24.0	Ħ	H	H
	£150.1	¥/#	7	8-6	SX	7.08	7.22	6.94	Ħ	Ħ	H
Alkalinity - Total	S244.03	1,0	7	2	SN	173.6	119.6	22.0	H	H	H
Ricarbonate	2070	1.0	Ž	S	SE	211.8	145.9	87.8	H	H	H
Total Dissolved Solids	£160.1	3.0	7	200	200	485	326	398	Ħ	H	H
Chloride	E125.3	-	7	220	220	97.0	35.0	9	H	H	H
Fluoride	E340.2	0.050	Ì	~	1.4	0.11	0.14	0.3	H	H	IN
Ritrate + Ritrite	F353.3	0.050	Ì	10	45	9.1	8.6	36.9	Ħ	H	Ħ
Sulfate	£378.4	1.0	Ì	250	220	8.9	17.0	26.0	Ħ		Ħ
	010978	1.00	Ì	S	SI	7.65	8.0	20.5	Ħ	Ħ	H
Megnesia	SAKO10	1.00		S	SX	32.7	19.2	10.0	H	Ħ	Ħ
Potagain	546010	9		S	SE	2	2	7.40	H	H	H
Sodila	010975	00	7	SZ	SN	19.0	14.4	48.1	H	#	Ħ
Methylene chloride	S146010	•	7/97	S	SE	9	2	2	2	16(18)	욮
Trichlocoethene	Su6010	-	7	'	5	28(30)	20(23)	2	3(2)	2	3(2)
Tetrachloroethene	010078	-	7/05	2000	•	3(1)	~	3	2	2	2
Tolinene	S-18020	-	7	14.300	5	2	-	9	H	Ħ	Ħ
M-Mitrosodipherylamine (1)	SW6270	5	3	SE	SN	•	₽	욮	H	Ħ	H

NOTES: Results reported for detected analytes only.

NT: analyte not tested ND: analyte not detected.

NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

e: equipment wash blank f: field replicate R: resample

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

TABLE 4.1.13-3

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

AMALYTICAL RESULTS TABLE FOR SITE 13

				and Action	Levels (a)	13-C-1GN	13-C-2GH	13-C-3GU	13-C-3GM		13-C-364
Porameter	Method	Detection Limit	Saits	Federal	State	BAFB-0681 11/13/89	BAFB-0687 11/15/89	BAFB-0683 11/14/89	8AFB-0684 11/14/89	BAFB-0685 11/14/89	8AF8-0686 11/14/89
Specific Conductivity	E120.1	1.0	umpos/cm	S¥	8	450	8	90,	:	=	
Temperature	E170.1	K/N	D 540	S	SH	18.5	18.0	17.0	17.0	H	H
7	E150.1	W/W	7	2-9	SN	7.21	7.24	7.8		H	Ħ
Alkalinity - Total	504603	1.0	7	2	SH	Ħ	100.4	130.2		8.2	Ħ
Ricarbonate	504603	0.	Ì	SZ	SR	T.R.	122.5	158.8		10.0	T.R
Total Dissolved Solids	E160.1	3.0	7	200	200	380	146	<u>8</u>		18.0	Ħ
Chloride	E325.3	1.0	7	250	220	63.5	28.0	56.5		윺	7
Fluoride	E340.2	0.050	Ž	~	1.4	0.15	0.20	0.17		2	Ħ
Mitrate + Mitrite	E353.3	0.050	Ì	10	45	22.9	16.0	11.0		욯	FW
Sulfate	E375.4	1.0	Ì	250	220	27.3	14.8	16.8		9	Ħ
Berice	Su6010	0.100	Ž	¥	SE	0.128	윺	9		2	
Calcium	Su6010	9	Ì	S	SE	42.1	27.5	38.1		2	H
Hacnesica	Su6010	8	Ž	SE	SH	27.9	17.8	23.1		2	H
Sodium	Su6010	8	7	S	SE	16.8	13.2	16.8		윺	12
Zine	SW6010	0.0200	Ž	0.110	0.012	0.0293	윺	2		9	114
trans-1.2Dichloroethene	Su6010	-	7/95	SN	SH	14(92)	2	2(4)		2	₽
Trichlocosthene	Su6010	_	3	'	~	550(540)	(9)9	7(73)		욮	2
1.1.2-Trichloroethane	Su6010	_	j	SE	32	10(19)	2	2		윺	2
Tetrachiocoethene	Sub010	-	~ ~	2000	5	7(10)	2	2(3)		2	2
Toluene	S46020	-) 9	14,300	5	600	3(0)	2(0)		1(0)	ş
M-Mitrogodiphenylamine (1)	\$16270	5	7	SZ	SE	•	9	€0	3	87	E E
bis (2-Ethylhexyl)Phthalate	SUB270	2	3	SZ	SE	10 8	2	2		8.3 14	8 TM

e: equipment wash blank f: field replicate R: resample 8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

NI: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists. b: field blank (ambient condition blank) R: resample (): values listed in () are 2nd column confirmation values.
a: Values represent most atringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.13-3 (continued)

				Standards, Candada Action L	Criteria Levels (a)	13-0-469	13-C-5GU	13-C-6GU	13-A-1GW	13-A-2GH	W 3-80
		Detection	_			BAFB-0703	BAFB-0709	BAFB-0680	BAFB-0682	BAFB-0702	BAFB-0737
Perameter	Method	Limit	Units	Federal	State	11/21/89	11/27/89	11/13/89	11/14/89	11/20/89	12/11/89
Snecific Conductivity	E120.1	0.1	umpos/cm	ST	8	34.2	i	:		345	
Temperature	£170.1	V/N	oap C	SH	SH.	17.5				19.0	
7	£150.1	X/X	7	2-9	SH	7.19	7.18	7.37	7.26	7.29	7.10
Alkalinity - Total	20403	1.0	1/0	2	SE	H				83.8	
Ricarbonate	204403	0.7	/0	SN	SN	H				102.2	
Total Dissolved Solids	£160.1	3.0	7/0	200	200	338				278	
Chloride	E325.3	1.0	1/0	250	250	35.1				37.4	
Fluoride	£340.2	0.050	1/02	~	1.4	0.17				0.16	
Mitrate + Mitrite	E353.3	0.050	Š	•	45	6.0				3.3	
Sulfate	E375.4	0.0	\	250	250	11.9				14.5	
	546010	0.100	7	SX	SE	2				9	
Calcium	516010	9.1	1/0	SE	SH	30.7				29.7	
Magnesius	Su6010	8.	\ <u></u>	SH	SE	20.8				19.5	
Manage	Su6010	0.0150) /a	રું		2				Q	
Sodium	SW6010	8	Ž	S¥	SH	15.1				14.9	
Zine	S46010	0.0200	1/0	0.110	0.012	₽				2	
Trichloroethene	Sub010	-	3	S	5	45(46)				17(25)	
Diethylchthalate	SW6270	9	7	SH	SN	8 2	_	2		~	~
M-Mitrosodiahenvissine (1)	SW6270	2	7	SE	SH	6	_	2	_	60	_
Di-n-Butylchthalate	SW6270	2	3	SE	MS	9 ~				•	_
bis(2-Ethylhexyl)Phthalate	SW6270	2	7/95	SN	SN	€			~	4	
						*********	********				,

NOTES: Results reported for detected analytes only. NT: analyte not tested ND: analyte not detected.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

e: equipment wash blank f: field replicate R: resample

MS: No standard criteria or action level currently exists. b: field blank (ambient condition blank) R: resample (): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.13-3 (continued)

				Standards, (and Action 1	Criteria Levels (a)	M97-3-80	M95-J-80	13-C-1SW	13-c-1su ^f	13-C-15V	13-C-15W
Parameter	Method	Detection Limit	, Units	Federal	State	BAFB-0738 12/11/89	BAFB-0741 12/12, e.	BAFB-0726 12/04/89	JAFB-0727 12/04/89	BAFB-0728 12/04/89	BAFB-0729 12/04/89
Specific Conductivity	£120.1	1.0	Lathos/CB	SE	8	171	**************************************	607		- H	
Temperature	E170.1	W/W	o o o	S	SI	17.0	19.5	15.0		H	Ħ
7	£150.1	K/M	7	2-9	SE	7.19	7.10	6.81	6.81	×	-
Alkalinity - Total	204403	0.1	 	20	SZ	H	H	8.69		31.5	T.W
Bicarbonate	SEK 03	1.0	1/0	SN	SN	H	Ħ	85.2		38.4	=
Total Dissolved Solids	E160.1	3.0	7/02	200	500	X	L-12	415		12.0	EX.
Chloride	£325.3	1.0	1/64	250	250	H	×	62.8		9	Ħ
Fluoride	E340.2	0.050	7	7	1.4	H	Ħ	0.26		₽.	Ħ
Entrate + Entrite	E353.3	0.020	7	10	45	Ħ	=	κ. 8		0.40	Ħ
Sulfate	E375.4	1.0	1/02	220	250	H	H	56.9		9	×
Chemical Oxygen Demand (COD)		7.0	7	SE	SE	H	H	44.5		3	T#
Lead		0.0020	7	.05	.05	H	Ŧ	욮		9	H
	Su6010	9.	7/50	SE	SE	F.	E	23.4		윺	<u> </u>
Magnesium	Su6010	8	7/0	SR	SE	Ħ	Ħ	11.0		¥	Ħ
Potassium	Su6010	8.	1/08	SE	SE	H	=	8.38		۽	¥
Sodia	SW6010	8.	7/02	S¥	S		H	52.6		2	E
Zire	Su6010	0.0200	1/04	0.110	0.012	Ħ	H	0.0416		2	Ħ
Trichloroethene	Su 8 010	-	7/80	~	'	1(3)	9	2		9	9
Diethylphthalate	SW8270	5	7/07	SE	SH		H	2	2	7	- H
M-Mitrosodioheny(spine (1)	SW8270	5	-\b	SN	SE	H	Ħ	0	3 5	Ξ	E
Di-n-Butylphthelate	SW8270	5	1/80	SN	ST	H	H	~	83 5	BJ 15	FK 8
							,,			*********	

MOTES: Results reported for detected analytes only.

MI: analyte not tested

MI: analyte not tested

MI: analyte not detected.

MI: detected in blank

MI: detected in blank

MI: detected in blank

MI: detected in blank

MI: field replicate

MI: field replicate

MI: field blank

MI: field blank

MI: field replicate

MI: field replicate

MI: field replicate

MI: field blank

MI: field replicate

MI: field blank

MI: field replicate

MI: field blank

MI: field replicate

MI: field blank

MI: field bl

Table 4.1.13-4
RANGES OF CONTAMINANTS DETECTED AT SITE 13

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
SOIL BORINGS			• • • • • • • • • • • • • • • • • • • •	
mercury	mg/kg	ND	0.24	2/29
TFH-gas	mg/kg	ND	30	1/29
toluene	mg/kg	ND	0.065	25/29
trans-1,2-dichloroethene	mg/kg	ND	0.21	4/29
trichloroethene	mg/kg	ND	0.21	6/29
1,1,2-trichloroethane	mg/kg	ND	0.062	2/29
chloroform	mg/kg	ND	0.006	3/29
bis(2-ethylhexyl) phthalate	mg/kg	ND	0.21	2/29
di-n-butyl phthalate	mg/kg	ND	5.4	11/29
butyl benzyl phthalate	mg/kg	ND	0.54	1/29
GROUNDWATER				
mercury	mg/l	ND	0.00080	1/30
trans-1,2-dichloroethene	ug/l	ND	160	7/35
1,1,2-trichloroethane	ug/l	ND	20	6/35
tetrachloroethene	ug/l	ND	28	11/35
trichloroethene	ug/l	ND	1500	33/35
chloroform	ug/l	MD	3	3/35
toluene	ug/l	ND	20	9/35
bis(2-ethylhexyl) phthalate	ug/l	ND	4	5/30

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (8), and analytes detected only once at a level below the LOG (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.13.2 Sampling and Analytical Problems

4.1.13.2.1 Loss of Samples

There were no sample loss problems for Site 13 samples. A total of nine soil samples were resampled for mercury and percent moisture analysis due to violations of holding times. In addition, five soil samples missed holding times for mercury but were not resampled. Other scheduled analyses which were not completed due to laboratory handling problems were one soil sample for volatile organics (8240), one soil sample for TFH-diesel, and one groundwater sample for semivolatile organics (8270). The omission of these analyses is not considered critical to the final evaluation of site conditions for the following reasons:

- o Four of the missing mercury analyses were from soil boring 13-C-5SB which had no evidence of positive contamination by other analytes within the same samples.
- The other missing mercury analysis was from soil boring 13-C-2SB, at a depth of 57.5-59.0 feet (51 feet vertically). This was the most highly contaminated soil sample collected at Site 13 (volatile organics). Other samples in the boring were also contaminated with volatile organics but did not contain detectable mercury.
- o The missing TFH-diesel analysis was from soil boring 13-C-2SB, at a depth of 7.5-9.0 feet (7 feet vertically). That sample did not contain TFH-gas nor quantifiable levels of organic compounds. Additionally, no TFH-diesel was found in any of the 28 soil samples analyzed for TFH-diesel.
- o The missing volatile organic analysis was from soil boring 13-C-5SB, from a depth of 47.5-49.0 feet (42 feet vertically). Volatile organic analyses were obtained for the samples above and below the missing sample.
- o The missing semivolatile organic analysis was from well 13-C-3. The well will be resampled during

the three subsequent rounds of water sampling. No semivolatile organic compounds, other than bis(2-ethylhexyl) phthalate, were detected in the other groundwater samples.

4.1.13.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil and water samples collected at Site 13 contained several organic compounds that were probably laboratory or field induced false positive results. Many of the soil samples collected contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks at similar concentrations.

Several soil and first round groundwater samples contained the semivolatile compounds bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and n-nitrosodiphenylamine, which were also detected in the method blank. Bis(2-ethylhexyl) phthalate was also tentatively identified in the first round surface water sample and the associated method blank at similar concentrations.

In the second round groundwater sample from well 13-C-1, n-nitrosodiphenylamine was estimated below the LOQ in the field replicate sample, the equipment wash blank, and the method blank but not in the original normal environmental sample. For groundwater sample 13-C-5, n-nitrosodiphenylamine was estimated below the LOQ in both the sample and the associated method blank. For 13-C-1SW, n-nitrosodiphenylamine was estimated below the LOQ in the method blank, the original surface water sample, the field replicate, and the equipment wash blank. For 13-C-2 and 13-C-3 in the second round, n-nitrosodiphenylamine and bis(2-ethylhexyl) phthalate were detected below the LOQ in both the sample and the associated method blank. In the third round, groundwater sample 13-C-6 bis(2-ethylhexyl) phthalate was estimated below the LOQ in both the sample and the associated method blank.

In the second quarter, surface water sample 13-C-1SW methylene chloride was detected by 8010 analysis and confirmed in the second column confirmation for both the ambient condition blank and equipment wash blank, but was not detected in the original sample or in the field replicate. The ambient condition blank for the third quarter off base sample also contained methylene chloride when the original sample did not. This occurred a number of times in the second and

third sampling rounds and is believed to be due to contaminated Type 1 organic free water used for the blanks.

In the fourth quarter N-nitrosodiphenylamine and Di-n-Butyl-phthalate were detected below the LOQ in both the sample and the associated method blank in groundwater samples 13-A-2, 13-C-3 (field replicate), 13-C-4, and surface water sample 13-C-1. N-nitrosodiphenylamine was detected below the LOQ and in the associated method blank for 13-C-1, 13-C-3, and 13-C-5. It was detected in the method blank and at the LOQ in 13-A-1 and in the blank for 13-C-6. Di-N-Butylphthalate was detected below the LOQ in both the sample and the associated method blank in 13-A-2 and 13-C-4. Bis(2-Ethylhexyl) Phthalate was detected in the replicate sample and the associated method blank for 13-C-3 and the equipment wash blank for 13-C-3.

Toluene was detected in most of the soil samples. This occurred for samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is a false positive result. For soil replicate QC samples from other sites on base in which toluene was detected, duplication of the toluene result generally was not good. This is another indication that the toluene is probably not a true contaminant present at the site.

Chromium and iron, among other metals, were detected in all soil samples. For 5 of the 29 soil samples, chromium and iron were also detected in the associated method blank. This does not mean, however, that chromium and iron should be considered false positive results for these samples. They are naturally occurring metals which are consistently found in soil samples at higher concentrations than detected in the blank.

4.1.13.2.3 Analytical Results Obtained Under Out-of-Control Conditions

Third quarter off base well samples OB-C-3 and -4 both exceeded the allowable surrogate spike percent recovery range of 70 to 130 percent for 8010 analyses on the first column.

The 8020 analysis trifluorotoluene surrogate spike for the 13-C-2 sample and 13-C-3 ambient condition blank was 135 percent which is outside the acceptable range of 70 to 130 percent surrogate spike recovery. The 8270 semivolatile organics analysis for surface water sample 13-C-1 had several surrogate spike recoveries below the acceptable range: Nitrobenzene-d5 was 28 percent (below the 35 to 144 percent range), 2-Fluorobiphenyl was 42 percent (below the 43 to 116 percent range), and 2-Fluorophenol was 19 percent (below the 21 to 100 percent range).

4.1.13.2.4 Corrective Actions Applied to Out-of-Control Events

The third quarter off base samples were also run using the second column, giving surrogate spike recoveries of 94 percent in each case and TCE concentrations of 2 ug/1, which are used in this report.

4.1.13.3 Significance of Findings

Soil

Soil sampled at Site 13 contained TFH-gas components in one sample. The TFH-gas was detected in the 28-foot sample from 13-C-5SB at 30 mg/kg, with an LOQ of 25 mg/kg. Because TFH-gas was detected at only one location, and because the analysis for volatile organics did not detect any common gasoline components (other than the probable false positive toluene), this result may not represent real contamination. The LUFT cleanup standard computed for TFH-gas at this sample location is 100 mg/kg.

Soil sampled from 13-C-2SB contained TCE and/or trans-1,2-DCE in samples from 18 feet, 28 feet, 48 feet, and 58 feet (actual vertical depths of 16, 24, 42, and 50 feet). Chloroform and 1,1,2-trichloroethane were also detected in the 58-foot sample (50 feet vertically). Concentrations for these four compounds ranged from the LOQ (0.006 mg/kg) to 0.21 mg/kg for both DCE and TCE at 58 feet (50 feet vertically). The DHS TTLC for TCE is 2,040 mg/kg. DHS TTLC values are not available for the other organic compounds.

Several other volatile and semivolatile organic compounds were detected in boring 13-C-2SB as well as other borings, including the background boring. These included acetone, methylene chloride, toluene, and two phthalate compounds. Acetone and methylene chloride are common laboratory contaminants and were detected in laboratory blanks. The phthalates were detected generally at or below the detection limit and bis(2-ethylhexyl) phthalate was detected in the lab blanks.

Organic compounds were detected in other borings at various locations. Aside from the probable false positive results discussed above, chloromethane, chloroform, TCE, and 2-butanone were detected in boring 13-C-3SB (northeast area), and TCE was reported at the detection limit in one sample from boring 13-C-5SB (southern area). All of these compounds were detected at or below the detection limit, and/or were detected in the lab blank. Therefore, the only boring with definite contamination (TCE and trans-1,2-DCE) is the boring in the northwest area of the landfill (13-C-2SB).

Metals detected in the soil. other than mercury, are those that may commonly occur in sediments, and no trends were observed that would indicate the presence of contamination by metals leaching from the landfill. This is to be expected because the predominant clays at Site 13 would tend to attenuate metals in solution. Mercury was detected in two samples (7 and 16 feet vertically) from 13-C-3SB at 0.24 and 0.11 mg/kg. The TTLC for mercury is 20 mg/kg. No metals were detected at levels greater than their respective California DHS TTLCs.

Groundwater

Groundwater encountered during installation of Stage 2-1 wells at Site 13 indicated that the uppermost permeable zone generally occurred under confined conditions. Water levels rose in the finished wells above the level where saturated soils were first encountered during drilling. The groundwater potentiometric surface at Site 13 is at an elevation of approximately 5 to 10 feet above NVGD, indicating that water levels have risen substantially over the past 3 years. Despite this rise, there was a vertical head difference of approximately 6 feet (downward) across a 20-foot-thick clay bed located between the first and second uppermost permeable zones.

For all eight wells sampled at Site 13 during the four quarter sampling rounds, general water quality parameters such as specific conductivity, total dissolved solids, alkalinity, and pH were similar and did not indicate the presence of contamination. Other than calcium, potassium, magnesium, manganese, sodium, and zinc, no metals were detected in the groundwater, except for the upgradient well 13-C-5. There mercury was detected at 0.0008 mg/l in the first round, slightly above the LOQ of 0.0005 mg/l. Mercury was not detected in later rounds. The DHS primary MCL for mercury is 0.002 mg/l. Manganese was detected in well 13-C-5 in all

four sampling rounds and was above the secondary MCL of 0.05 mg/l in the second, third, and fourth rounds.

Groundwater at Site 13 contains chlorinated organic solvents. TCE, trans-1,2-DCE, 1,1,2-trichloroethane (1,1,2-TCA) and tetrachloroethene were detected in all four sampling rounds at well 13-C-1. This well is located near the northwest edge of the landfill near soil boring 13-C-2SB which had TCE detected in soil samples. The concentration of TCE dropped consistently in quarterly samples from 1,500 to 880 to 620 to 550 ug/l while the other chemicals showed no distinct trend in well 13-C-1. TCE was detected in all wells at Site 13 including deep well 13-C-2 and background well 13-C-5 during all four sampling rounds, with the exception of 13-A-1 in the first round. Organic chemical concentrations increased in successive rounds in wells 13-A-1, 13-C-3, and 13-C-4 while 13-A-2, deep well 13-C-2, and background well 13-C-5 showed no distinct pattern. The EPA drinking water standards MCL of 5 ug/1 for TCE was exceeded in all wells sampled at Site 13 in the second and third sampling rounds. The presence of TCE at downgradient well 13-C-6 at 6 ug/l in the third quarter and 4 ug/l in the fourth quarter indicates that organic chemicals may have traveled down gradient from Landfill No. 1 at least as far as well 13-C-6. TCE was also detected at 2 ug/l in the third quarter sample and 1 ug/1 in the fourth quarter sample from an off base well 2,200 feet northwest of Site 13.

Trans 1,2-DCE was detected in all four rounds at 13-C-1 at similar concentrations based on the second column confirmation data. However, the only other time it was detected was in the second round at 13-C-3 at 6 ug/l and the fourth round at 2 ug/l. No MCL is available for trans 1,2-DCE. 1,1,2-TCA was detected in all four rounds at 13-C-1 at similar levels, all of which are below the EPA drinking water standards MCL of 32 ug/l. 1,1,2-TCA was not detected in other wells at Site 13.

Tetrachloroethene was detected in all four rounds at 13-C-1 at similar levels, all of which exceeded the EPA drinking water standards MCL of 5 ug/l. In the second and fourth rounds, tetrachloroethene was also detected in 13-C-3 below the MCL and in the third round at 13-C-3 above the MCL and in 13-C-4 below the MCL.

Surface Water

Surface water sampled at Site 13 generally has the same characteristics as the surface water sampled at Site 6

(upstream). Surface water sampled adjacent to Site 13 was free of organic contaminants. The general water quality parameters of specific conductivity, alkalinity, bicarbonate, total dissolved solids, and chloride all had lower values than did the groundwater samples, which is a pattern typical of surface water samples from Beale AFB. Nitrate increased dramatically from 12.6 in the first round to 74.0 mg/l in the second, above the EPA primary drinking water standard MCL of 45 mg/l for nitrate, dropped below the MCL to 36.9 mg/l in the third round, and rose to 75.8 mg/l in the fourth round. COD in round one was measured at 19.7 mg/1, rose to 56.3 mg/1 in the second round, dropped below the 7.0 mg/l LOQ in the third, and rose to 44.5 mg/l in the fourth round. There is no MCL for COD. Iron was detected in the surface water in the first and second rounds, but not in the groundwater. The only other metal in the surface water besides calcium, potassium, magnesium, sodium, and zinc was lead, which was found in the first round at the LOQ of 0.005 mg/l and in the field replicate sample in the fourth round at 0.0417 mg/l. The DHS MCL for lead is 0.050mg/1. The EPA MCL goal is 0.020 mg/1.

Geophysics

A geophysical investigation was conducted on the eastern side of Site 13 to determine if other trenches existed. Seven areas of buried metal were delineated, as illustrated in Figure 4.1.13-16. The ground surface was irregular with depressions indicative of previous excavation and backfilling. Often waste disposal areas were associated with these depressions.

4.1.13.3.1 Zones of Contamination

It is concluded that Site 13 is affecting the environment in the form of chlorinated volatile organic compounds. Soil has been affected in the northwestern area of the site. TCE and 1,2-DCE were detected in the 58-foot sample (50 feet vertically, deepest in the boring) in 13-C-2SB, so the lower extent of the soil contamination cannot be determined. Groundwater in the same area (well 13-C-1) has been contaminated with the same compounds plus 1,1,2-TCA and tetrachloroethene. TCE was also detected at much lower concentrations, but above the EPA MCL, in all other wells at Site 13, including the up-gradient well, deep well 13-C-2, and the new well 13-C-6 about 1,000 feet downgradient of the landfill. The well at the off base farm, about 2,200 feet downgradient of Site 13, had 2 ug/l TCE in the third round and 1 ug/l in the fourth. Neither the extent nor source of

groundwater contamination have been fully determined in the Site 13 area.

4.1.13.3.2 Contaminant Migration

Groundwater at Site 13 is flowing to the northwest and appears to have a downward potential flow. Contaminants detected in the groundwater at Site 13 will migrate in this direction.

Hutchinson Creek is probably a "losing stream." Therefore, water quality in the creek may not be affected by contaminants from the landfill unless those contaminants move laterally through the unsaturated zone soil or are transported into the creek by surface runoff. Movement of percolating water in the vadose zone is normally vertical; lateral movement is not expected in the vadose zone at Site 13.

4.1.13.3.2.1 Potential to Move Off Site and Off Base

Groundwater samples containing 6 ug/l of TCE were taken in the third quarter and with 4 mg/l TCE in the fourth quarter from downgradient monitoring well 13-C-6 located 1,000 feet northwest of well 13-C-1 and about 500 feet east of the base boundary. This indicates that TCE may have migrated to within 500 feet from the base boundary at concentrations exceeding MCLs. Groundwater in the vicinity of Site 13 has an estimated rate of flow of about 360 feet per year as noted below. Therefore, it is likely that groundwater containing TCE will move or has moved downgradient towards the base boundary. Samples taken during the third and fourth quarters from a farm well about 2,200 feet northwest of Site 13 contained 2 and 1 ug/l TCE, respectively, although the continuity of the plume can only be inferred based on the available data.

4.1.13.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Linear groundwater velocity can be approximated using the equation v = Ki/n, where v = average linear groundwater velocity, K = hydraulic conductivity, i = groundwater gradient, and n = effective porosity. For Site 13, a representative value of the hydraulic conductivity can be derived using an average hydraulic conductivity of 28 feet per day as determined in the 72-hour pump test conducted in well 19-C-4. The regional groundwater gradient (i) in the vicinity of Site 13, taken from Plate 3, is i = 0.007 foot per

foot to the northwest. The estimated effective porosity for permeable sediments, through which groundwater will flow preferentially, is 20 percent (0.20). Using these values gives:

 $v = Ki/n = (28 ft/day \times 0.007/0.20) = 0.98 ft/day,$

or for an estimated yearly velocity of:

0.98 ft/day x 365 days/yr = 360 ft/yr

The gradient, and thus rate of flow, may steepen nearer the agricultural wells west of the base with a resulting increase in groundwater velocity.

4.1.13.3.2.3 Time of Travel to Receptors

The nearest potential downgradient receptor is the farm 2,200 feet northwest of Site 13. Using only the average linear groundwater velocity, the estimated travel time for groundwater from Site 13 to the residence is approximately 6 years. However, many factors affect contaminant transport in groundwater, and most of these factors are not well defined in this project. Some of these factors act to shorten and some to lengthen the travel time of a contaminant in groundwater. Since it is not known when contaminants entered the groundwater at Site 13, estimates cannot be made of how far migration has progressed or where the leading edge of the plume is located.

4.1.13.3.2.4 Applicability of Solute Transport Models

A solute transport program could not effectively model Site 13 due to the nonhomogeneous soil deposits typical of Beale AFB.

4.1.13.3.2.5 Expected Spatial and Temporal Variations in Concentration

Based on observations through the four rounds of Stage 2-1 sampling, the spatial variation in TCE groundwater contamination has not changed significantly. TCE has also been detected at two additional downgradient sampling points (13-C-6 and the off-base farm), although the continuity of the plume between these points can only be inferred. Since the source of TCE contamination has not been identified, accurate estimates of temporal variations cannot be made.

4.1.13.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.14 DISCUSSION OF RESULTS FOR SITE 14: TRANSFORMER DRAINAGE PIT

During previous investigations conducted at Site 14 (Aero-Vironment, 1987), contamination was identified in 2 of 12 soil samples. Groundwater was not sampled at this site. The Air Force determined that no IRP activities would take place at this site during the Stage 2-1 Remedial Investigation. If it is determined that additional IRP actions are necessary, these actions will be included in future IRP tasks. If it is determined through risk assessment that no further action will be necessary, a Record of Decision will be prepared for the site.

4.1.15 DISCUSSION OF RESULTS FOR SITE 15: LANDFILL NO. 3

Site 15 is a currently active and permitted Class III landfill. Approximately 35 acres have been used to date, although 184 acres have been allocated for eventual use. The trench and fill method of operation is used to bury refuse. Trenches are oriented east-west, and the disposal area boundaries are well defined. The landfill at Site 15 does not have an engineered liner system or leachate collection system.

Landfill No. 3 has an ultimate capacity of 3.8 million cubic yards. Approximately 63,000 cubic yards of compacted domestic garbage and refuse have been accepted annually since 1980. Total waste in the landfill is currently estimated to be 630,000 cubic yards with a remaining capacity of approximately 3.2 million cubic yards. This gives a 40- to 45-year life expectancy for Landfill No. 3, allowing for increasing annual waste volumes.

Trenches used for waste disposal are about 35 feet wide, 15 feet deep, and 300 feet long. A minimum 6-inch compacted soil lift is placed over the waste material at the close of each operating day. No waste is exposed, and the cover is graded to prevent erosion and to keep water from ponding. A diversion ditch has been graded on the uphill side of the trenches to prevent surface water from running into the open pits.

One vertical background and four angled soil borings were drilled at Site 15 during the Stage 2-1 study. The four existing monitoring wells were sampled quarterly. Soil gas samples were collected from vapor wells constructed both above a capped landfill trench and adjacent to the landfill.

No organic compounds were found in the groundwater samples except the single detection of TFH-diesel at 0.090~mg/l in the fourth quarter sample from well 15-A-4. Arsenic was detected in the first quarter at the 0.005~mg/l LOQ in two samples and at 0.006~mg/l in a third quarter sample. No surface water samples were collected at Site 15.

The soil gas sample from the backfilled trench contained organic compounds, 16 percent methane and 2 percent oxygen. The OVA analysis of air pumped from the four adjacent vapor wells did not detect any vapor concentrations considered different from potential naturally occurring soil vapors.

4.1.15.1 Presentation of Results

The following section presents field investigation results at Site 15. The discussion focuses on the geology and hydrogeology at the site and presents the results of chemical analyses performed on groundwater and soil samples.

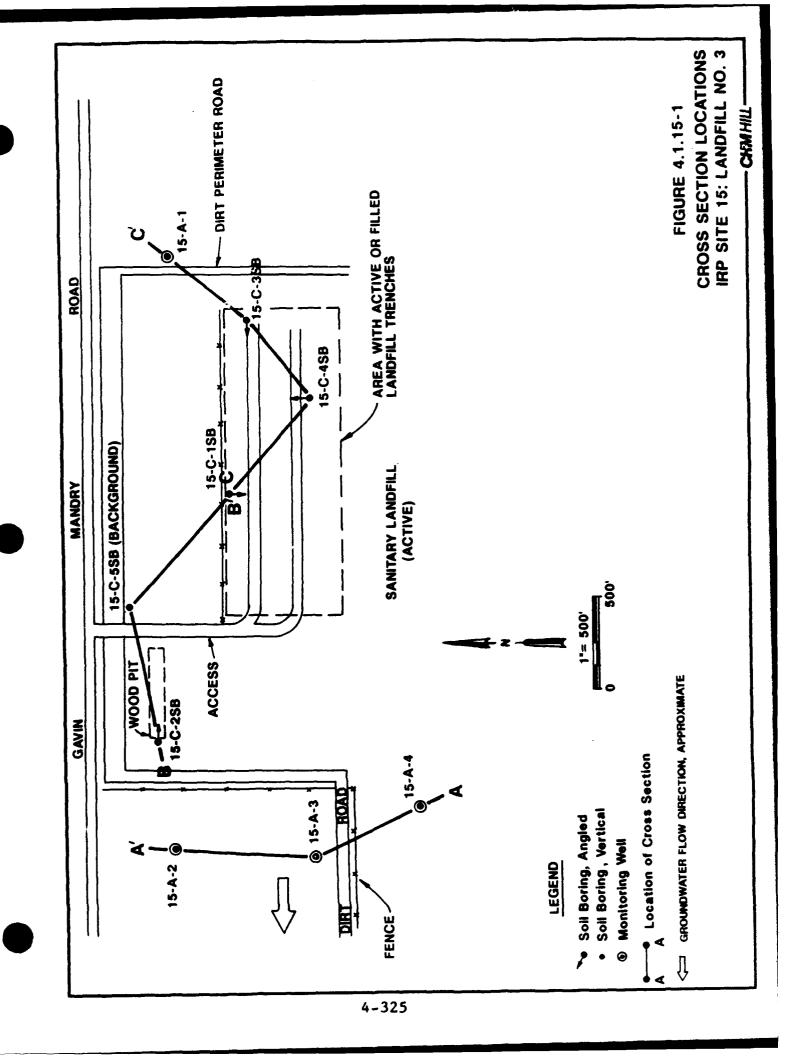
4.1.15.1.1 Site Geology

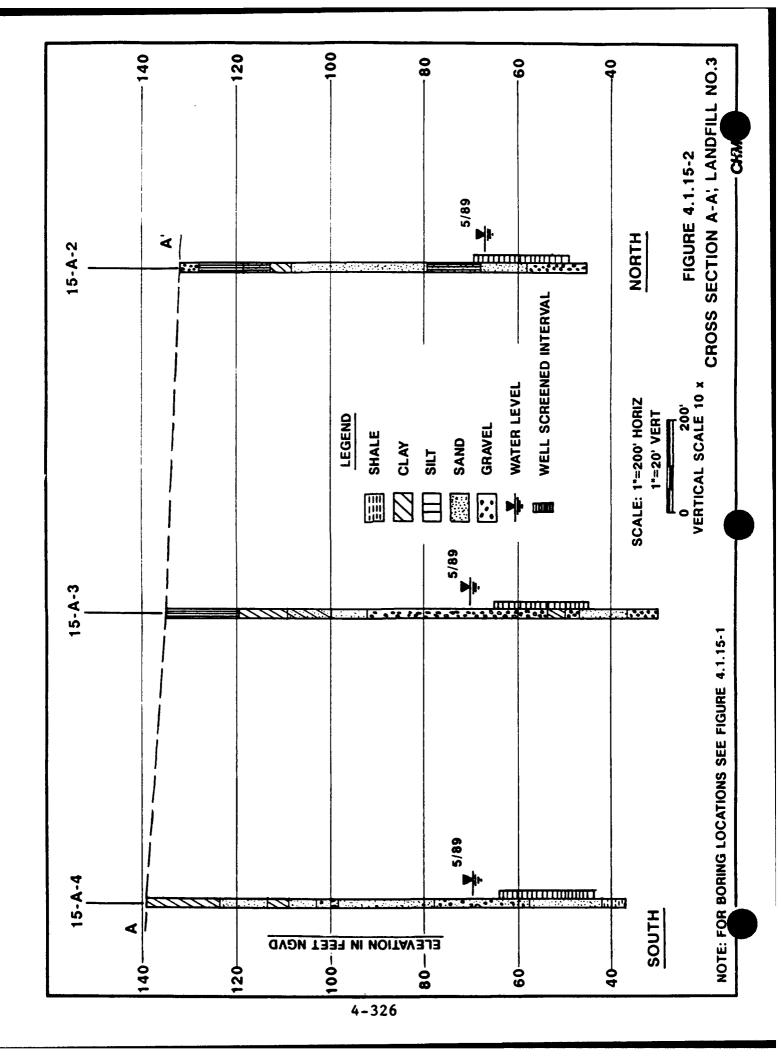
Evaluation of the geology at Site 15 (Landfill No. 3) is based on boreholes drilled during the current Stage 2-1 investigation, and on wells installed during the previous Phase II, Stage 1 investigation. During the current investigation, four angle borings were drilled to a nominal 60-foot depth (52 feet beneath the ground surface), and one vertical background boring was drilled to a 50-foot depth. During the previous Phase II, Stage 1 investigation, four monitoring wells were constructed.

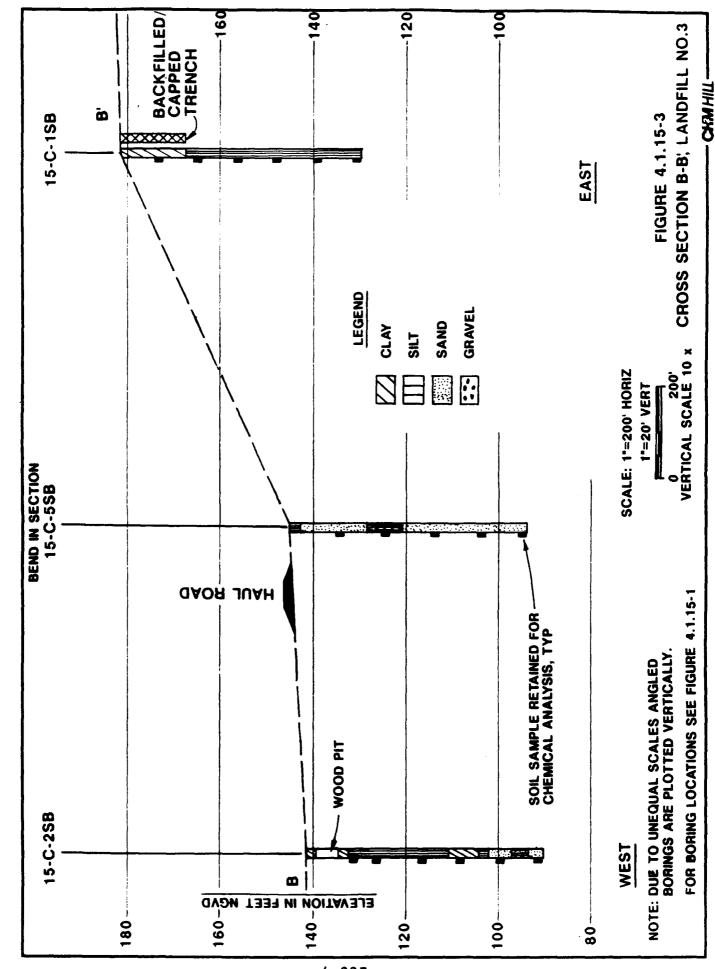
The well and borehole locations are shown in Figure 4.1.15-1. Soil boring logs are provided in Appendix D. Cross-sections through the soil borings and monitoring wells are located in Figure 4.1.15-1 and are shown in Figures 4.1.15-2, 4.1.15-3, and 4.1.15-4.

Near-surface materials at Site 15 appear to be predominantly fine-grained. However, at greater depth these give way to mainly coarse-grained materials. Below an elevation of about 100 feet NVGD on the western and northern side of the landfill, and 80 feet NVGD on the eastern side, the borings contacted sands and gravels to their total depth. Well 15-A-4 encountered a consolidated shale at a depth of 95 feet (45 feet NGVD). The other wells were all identified as being completed in unconsolidated materials (AeroVironment, 1987). However, the subangular gravels and shale fragments identified in well 15-A-3 at a depth of 87 feet (48 feet NGVD) may have originated from the top of the consolidated materials. Wells 15-A-3 and 15-A-4 were found to have low yields during sampling. In addition, well 6-C-1, the easternmost well at Site 6 about 1,500 feet west of Site 15, is completed in consolidated materials.

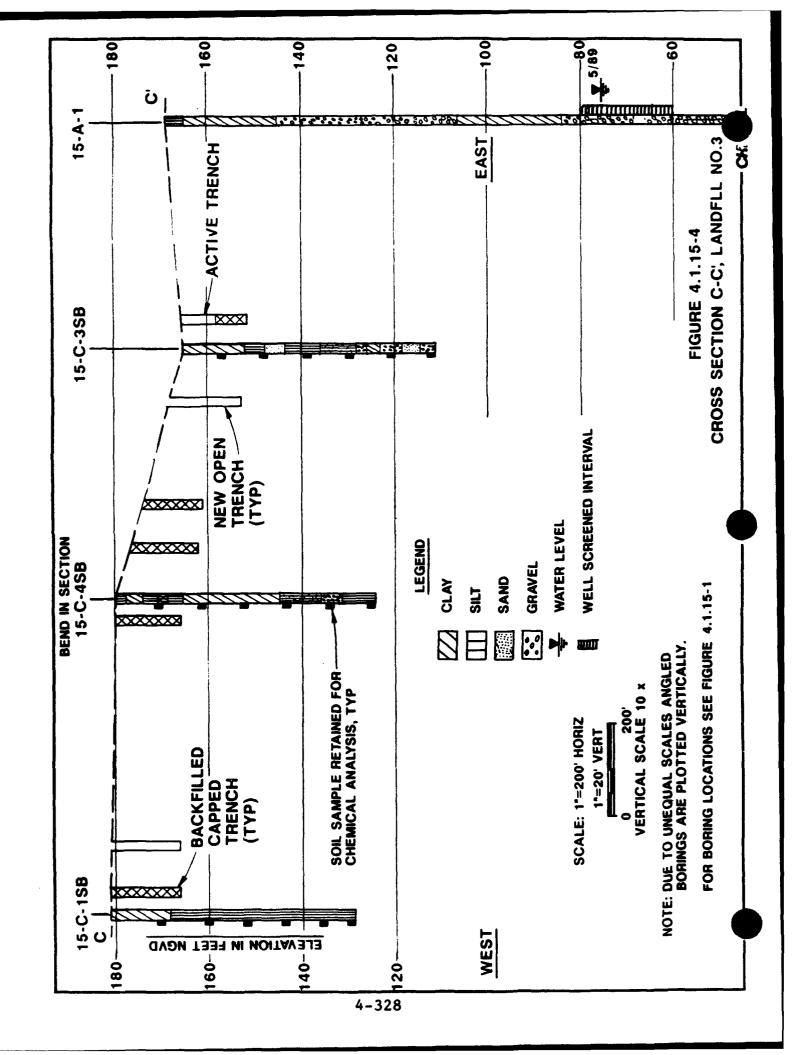
Surface soils at Site 15 are mapped as belonging to the Redding-Corning gravely loams, formed in alluvium from mixed sources (SCS, 1985). These surfaces are associated with the Laguna Formation and were so mapped in the vicinity of Site 15 by the U.S. Geological Survey (Page, 1980). Volcanic fragments described below 80 feet NGVD in well 15-A-1 and dark gray shale at 42 feet NGVD in well 15-A-4 may signify contact with volcanic rock from the Sierra Nevada, the geologic unit that lies under the Laguna Formation in the stratigraphic section at Beale AFB.







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4.1.15.1.2 Site Hydrogeology

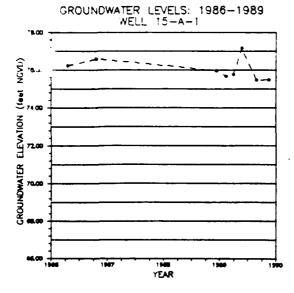
Groundwater at Site 15 appears to be unconfined. All the wells are described as being screened in sands and gravels, including well 15-A-4, which is screened above a shale unit. Wells 15-A-1 and 15-A-2 are screened across the water table. Water levels in wells 15-A-3 and 15-A-4 lie slightly above the screened intervals in sands and gravels.

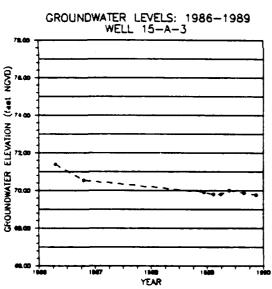
Groundwater levels at the monitoring wells near Landfill No. 3 were measured between April 1986 and November 1989 (Table 4.1.15-1 and Figure 4.1.15-5). May 1989 groundwater elevation contours in the southern part of Beale AFB are plotted on Figure 4.1.15-6 while regional contours are plotted on Plates 3 and 4. The average groundwater gradient at Landfill No. 3 in March 1989 was approximately 0.003 foot per foot to the west. However, downgradient from Site 15 the regional gradient is about 0.007. Groundwater levels in 1986 and 1989 are consistently lower in downgradient monitoring well 15-A-2 than in downgradient wells 15-A-4 and 15-A-3.

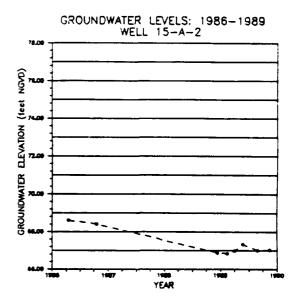
Table 4.1.15-1 GROUNDWATER ELEVATIONS: SITE 15 (FEET NGVD)

	Screened April Interval 1986							
15-A-1	81 to 61 76.23	76.58	75.96	75.67	75.77	77.16	75.47	75.48
15-A-2	71 to 51 68.60	68.40	66.86	66.82	66.97	67.32	67.00	67.02
15-A-3	65 to 45 71.40	70.55	69.92	69.81	69.82	70.01	69.88	69.78
15-A-4	64 to 44 72.60	70.68	69.89	69.74	69.70	69.88	69.93	69.82

Groundwater levels have remained stable or fallen slightly at Landfill No. 3 between April 1986 and November 1989. The fall in groundwater levels indicates that Landfill No. 3 is outside the immediate influence of the recovering groundwater depression to the west of Beale AFB. The hydrographs presented in Figure 4.1.15-5 are typical of wells located in the eastern part of Beale AFB.







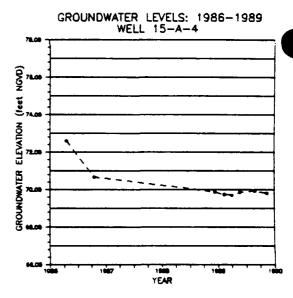
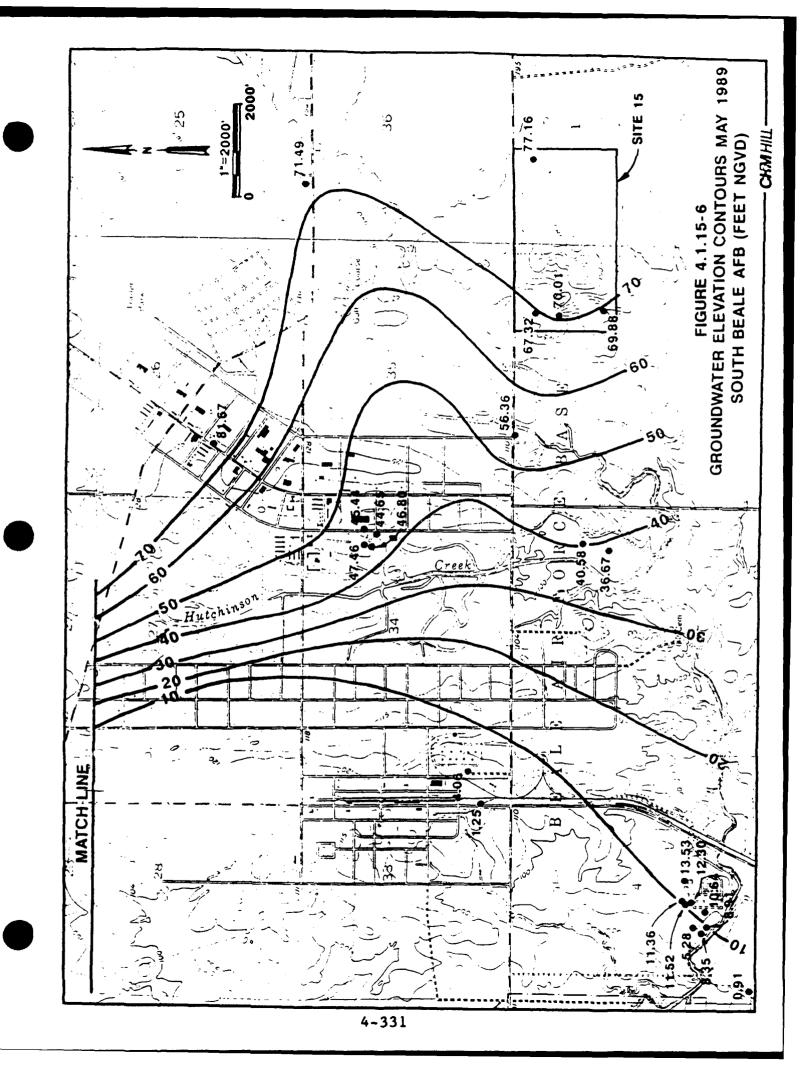


FIGURE 4.1.15-5
MONITORING WELL HYDROGRAPHS
SITE 15: LANDFILL NO. 3



No aguifer testing was performed at Site 15. However, a 72-hour multiple well pump test was conducted at Site 19 located 7,000 feet northwest of Site 15. Site 19 is in a hydrogeologic setting and in sediments similar to those downgradient from Site 15. Plots of the pump test data and a discussion of aquifer testing methodology are provided in Appendix E. The average value of transmissivity derived from the 72-hour drawdown and recovery data from pumping well 19-C-4 was 1,700 square feet per day, while the average value of hydraulic conductivity was 28 feet per day (0.01 cm/sec). An estimate of average linear groundwater velocity can be made by substitution into Darcy's Law. Using the average value of hydraulic conductivity of 28 feet per day, the regional hydraulic gradient of 0.007, and an estimated effective transport porosity of 0.20, the groundwater velocity is about 0.98 foot per day or 360 feet per year.

4.1.15.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.15.1.4 and in Appendix A.

Soil

A total of 29 soil boring samples were collected at Site 15: 5 from a vertical background boring and 24 from the 4 angle borings under landfill trenches. These samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method).

Toluene was detected in 26 of the 29 soil samples at up to 0.32 mg/kg. No other volatile organic compounds were detected.

Semivolatile organic chemicals detected in soil samples at Site 15 were below the LOQ. Bis(2-ethylhexyl) phthalate was detected in six samples at up to 0.32 mg/kg. Di-n-butyl phthalate was detected in eight samples at up to 0.34 mg/kg. N-nitrosodiphenylamine was detected in three samples at up to 0.057 mg/kg.

ICP metals were detected in soils at Site 15 at concentrations similar to background levels. Mercury was not detected in any sample. The following metals were detected in only one sample at greater than two standard deviations higher than background levels: barium, iron, manganese, magnesium, sodium, and zinc. Iron was detected in two samples at more than two standard deviations above background. In boring 15-C-3SB, TFH-gas was detected at 120 mg/kg at 18 feet (16 feet vertically), TFH-diesel at 30 mg/kg at 28 feet (24 feet vertically), and TFH-gas at 77 mg/kg at 38 feet (32 feet vertically). TFH-gas was found at 69 mg/kg at 30 feet in background boring 15-C-5SB.

Groundwater

No groundwater contamination was detected in the April, and October 1986 sampling rounds of the Phase II, Stage 1 investigation (AeroVironment, 1987).

Through four quarterly rounds of water sampling at Site 15, 16 groundwater samples have been collected. Analyses performed for water samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7421), mercury (7470/7471), selenium (7740), water quality parameters, TFH-diesel and -gas (California method), and COD.

No organic chemicals were detected in the first three quarters of groundwater sampling at Site 15. Arsenic was detected at the LOQ of 0.005 ug/l in downgradient wells 15-A-3 and 15-A-4 in the first sampling round. However, arsenic was not detected in the second or fourth quarterly sampling and was only detected in 15-A-4 at 0.006 mg/l in the third quarter. TFH-diesel was only detected in the fourth quarter in well 15-A-4 at 0.090 mg/l. Mercury, lead, selenium, and TFH-gas were not detected in groundwater at Site 15. COD was detected only in the 15-A-1 third round sample at 7.4 mg/l.

Groundwater is a sodium bicarbonate to sodium-magnesium bicarbonate type at Landfill No. 3. Total dissolved solids ranged from 198 to 252 mg/l in the first three sampling rounds. Groundwater quality parameters did not change significantly in the second, third, and fourth sampling rounds.

Surface Water

No surface water was sampled at Landfill No. 3. The nearest surface stream is a tributary to Hutchinson Creek, approximately 1,500 feet to the west. It was sampled at Site 6.

Landfill Gas

Landfill gas monitoring was completed at Site 15 in compliance with the California Air Resources Board Testing Guidelines for Active Solid Waste Disposal Sites (CARB, 1987).

Landfill emission screening was performed with an OVA calibrated to methane. The background concentration upwind of the landfill was measured at 8 ppm. During the screening walkover of the center acre of Landfill No. 3, four OVA readings above 50 ppm, the CARB screening guideline, were observed with the probe held within 3 inches of the surface. Concentrations of 100, 80, 70, and 60 ppmv were measured. Figure 4.1.15-7 shows the locations and magnitudes of the readings.

A ten-liter air sample from the landfill gas well was analyzed for fixed gases and the compounds listed in Attachment l of the California Air Resources Board Testing Guidelines for Active Solid Waste Disposal Sites. Table 4.1.15-2 provides a complete list of the detected Attachment l compounds and the fixed gases. Compounds detected were dichloromethane (4,500 ppbv), l,l,l-trichloromethane (68 ppbv), l,2-dichloroethane (100 ppbv), trichloroethene (880 ppbv), and tetrachlorethane (830 ppbv). Methane concentration was 16.16 percent and oxygen 1.78 percent by volume.

A 24-hour, 30-liter air sample was taken downwind of the landfill and analyzed (Table 4.1.15-3). The following chemicals were detected: dichloromethane (3.0 ppbv), 1,2-dichloroethane (1.1 ppbv), benzene (2.4 ppbv), carbon tetrachloride (0.22 ppbv), trichloroethene (2.5 ppbv), and tetrachloroethane (0.84 ppbv).

Each of the four soil vapor wells located along the perimeter of Landfill No. 3 (Figure 4.1.15-7) was monitored with an OVA while being purged. The purging continued until a stable OVA reading was reached (Table 4.1.15-4) in accordance with CARB monitoring guidelines. The OVA readings ranged from 7.0 to 26.0 ppm.

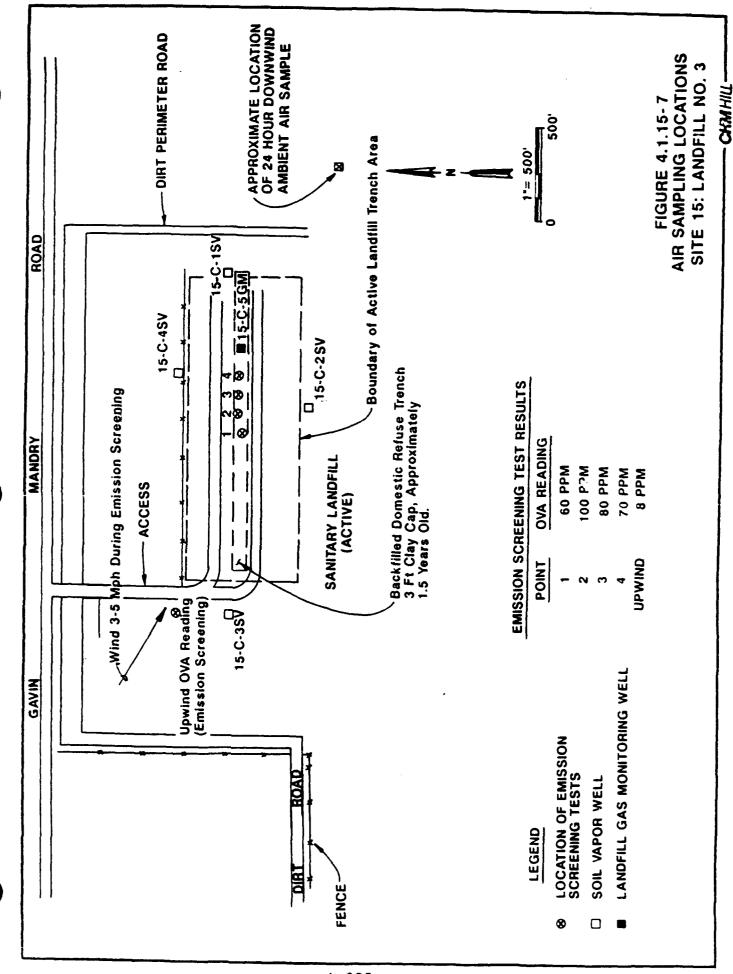


Table 4.1.15-2 LANDFILL GAS RESULTS

ATTACHMENT 1 COMPOUNDS DETECTED

Compound	Concen- tration (ppbv)	Concentration (mg/m³)	Minimum Detection <u>Limit (ppbv)</u>
Dichloromethane	4,500	16,000	60
1,1,1-Trichloroethane	68	380	10
1,2-Dichloroethane	100	410	20
Trichloroethene	880	4,800	10
Tetrachloroethene	830	5,700	10

FIXED GAS

Component	Sample Concentration Percent by Volume
Nitrogen	52.1
Oxygen	1.78
Methane	16.16
Carbon monoxide	<u><</u> 0.05
Carbon dioxide	8.6
Hydrogen	0.63

Note: ppbv = parts per billion by volume

Table 4.1.15-3 AMBIENT AIR RESULTS

ATTACHMENT 1 COMPOUNDS

Compound	Concen- tration (ppbv)	Concentration (mg/m³)	Minimum Detection <u>Limit (ppbv)</u>
Dichloromethane	3.0	11.0	1.00
1,2-Dichloroethane	1.1	4.5	0.20
Benzene	2.4	7.8	2.00
Carbon Tetrachloride	0.22	1.4	0.20
Trichloroethene	2.5	14.0	0.60
Tetrachloroethene	0.84	5.8	0.20

FIXED GAS

Component	Sample Concentration Percent by Volume
Nitrogen	78.0
Oxygen	20.92
Hydrogen	1.13

Note: ppbv = parts per billion by volume

Table 4.1.15-4
GAS MIGRATION TESTING RESULTS

OVA Reading (ppm)
13.0
7.5
7.0
26.0

4.1.15.1.4 Analytical Results Table

Table 4.1.15-5 presents a summary of all detected analytes for Site 15 excluding the results for the two air samples. Soil and groundwater analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.15-5 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.15.1.5 Discussion of Analytical Data

Contaminants were detected in some soil samples collected beneath Site 15. Most of these contaminants were either reported at concentrations below the LOQ or are suspected false positives. With the exception of arsenic, which was detected at the 0.005 mg/l LOQ or at 0.006 mg/l and the single detection of TFH-diesel at 0.090 mg/l in the fourth round sample at 15-A-4, no contaminants were detected in the groundwater. Contaminants were also detected in the landfill gas sample and, at mure lower concentrations, in the ambient air sample. Table 4.1.15-6 presents the range of contaminants encountered for each of the media sampled (soil, groundwater, air), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

TABLE 4.1.15-5

BEALE AFB: SOIL DATA 1968/1989

				Standards, and Action	Criteria Levels (a)	15-C-15B BAFB-0139	15-C-15B BAFB-0140	15-c-158 BAFB-0141	15-C-158 BAFB-0142	15-C-15B BAFB-0143	15-C-158 BAFB-0184
Parameter	Method	Detection Limit	Units	Federal	State	12/01/88	12/01/88	12/01/88	12/01/88	12/02/88	12/02/86
Percent Moisture	ASAMO	V/H	>4	SE	SE	13.4	18.4	27.1	27.3	21.6	19.7
Atumina	Suc010	20.0	MQ/kg	SE	SW	15500	16800	23000	20100	18200	26000
Berium	Su6010	10.0	mq/kg	SH	10,000	115	63.2	103	110	83.4	73.8
Beryllium	S46010	0.50	mg/kg	SH	ĸ	2	욡	욡	0.69	윺	0.62
Calcium	S46010	5	mo/ko	SE	SE	2540	6050	5540	5870	6240	999
Chronium	S 46010	3.0	MQ/kg	SN	200	32.7	38.1	28.0	34.3	37.1	24.0
Cobelt	Sta6010	4.0	Ma/ko	SH	8,000	11.5	18.4	16.5	24.8	23.0	23.7
Copper	Sta6010	3.0	mo/ko	SH	2,500	52.7	49.3	0.64	71.9	6.89	66.7
Lon	S146010	10.0	Mo/kg	S¥	SE	31900	≥7300	32000	35400	37400	47400
Megnesium	S46010	5	#0/kg	SN	SE	6280	7820	6450	95.20	9390	9000
Kanganese	S46010	1.5	MQ/kg	SE	SE	382	22	<u>8</u>	698	719	22
Mickel	Su6010	4.0	mo/kg	SH	2,000	19.6	32.0	24.7	8.62	27.6	33.4
Potassium	S146010	200	ma/kg	SH	SR	3	392	658	505	485	760
Sodius	Sta6010	5	mo/kg	SE	SH	232	ž	516	432	393	197
Thellies	Sw6010	50.0	Mo/kg	SI	ş	2	4.59	7.68	68.2	2	₹
Vanadium	SW6010	4.0	Mo/kg	SE	2,400	8.5	103	69.7	97.0	5.0 5.0	139
Zinc	SH6010	2.0	MO/kg	SZ	2,000	53.3	8.89	73.7	93.0	81.6	7.16
Methylene Chloride	SH6240	0.002	MQ/KG	SH	SH	0.023	0.074	0.0	0.028	0.024	0.058
Acetone	SMB240	0.010	MQ/Kg	SŦ	S¥	9	₽	윤	윺	0.29	0.23
1.1.1-Trichloroethane	SW8240	0.005	mo/kg	SZ	SH	2	욮	2	0.00	2	2
Toluene	SW6240	0.00	mo/kg	SH	SE	0.039	0.072	0.19	0.12	€	0.020
Phenol	S46270	0.33	m/kg	SX	SH	1.5	8 2.0	8 2.2	8 2.2	B 0.097	₽
N-ni trosodiphenylamine	S46270	0.33	mo/kg	SE	SE	2	윺	0.23	3	⊋	윤
Di-n-butylphthelate	S46270	0.33	mg/kg	ST	SH	9	2	₽	₽	0.4	0.19

MI: analyte not tested

MD: analyte not detected.

MD: assample are an action level currently exists.

MD: standard criteria or action level. See Appendix I.

MD: values listed to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

MD: standard for Nitrate - Nitrate and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. e: equipment wash blank f: field replicate R: resample NOTES: Results reported for detected analytes only.

TABLE 4.1.15-5 (continued)

					Criteria	15-C-158	15-C-25B	15-C-258	15-C-258	15-C-258	15-C-288	
		Detection		end Action	Levels (a)	62.4-63.1	11.5-13.0	17.5-19.5	27.5-29.0	37.5-39.0	47.5-49.0°	
Parameter	Method	Limit	Units	Federal	State	12/02/88	12/06/88	12/06/88	12/06/88	12/06/88	12/07/88	
Percent Moisture	ASARO	N/N	×	SE	SE	17.8	18.2	19.8	15.8	22.7	22.2	
Atuminum	Stu6010	20.0	mg/kg	SN	SZ	26200	17800	20400	10200	15300	14900	
Berich	Su6010	10.0	10/kg	S#	10,000	68.1	137	126	120	765	123	
Beryllica	SW6010	0.50	mg/kg	SN	ĸ	0.61	욮	₽	۽	ક	2	
Calcium	S46010	5	MQ/kg	SN	SE	6530	9930	0999	4520	6270	5120	
Chromium	Su6010	3.0	MQ/kg	N	200	51.9	9.44	8 50.1	8 20.2	8 37.4	8.9	-
Cobalt	Su6010	4.0	MQ/kg	SN	8,000	23.1	20.8	52.4	21.4	31.8	7.2	
Copper	Su6010	3.0	MQ/kg	SR	2,500	9.89	50.1	71.8	36.3	9.02	21.9	
Lori	Stu6010	10.0	mo/kg	SN	SE	78 700	35700	8 41900	8 23800	8 32200	B 15400	
Magnesium	SW6010	5	2 /kg	SN	SE	7860	7080	8380	5370	7220	2540	
Manganese	SW6010	1.5	20/kg	SX	S	2	787	895	829	3310	537	
Nickel	SW6010	4.0	MQ/kg	SM	2,000	31.8	30.3	31.4	17.8	33.9	7.7	
Potassium	SW6010	200	Mg/kg	NS	SH	1080	¥	& X	546	763	身	
Sodium	SW6010	<u>5</u>	mg/kg	SH	SH	371	3	<u>\$</u>	137	168	518	
Thailie	SW6010	20.0	mg/kg	SN	200	5	62.5	윺	2	윺	윭	
Vanadium	SW6010	4.0	mg/kg	SN	2,400	167	7.86	131	61.4	127	54.4	
2 inc	SW6010	2.0	mg/kg	SH	5,000	85.2	62.5	8.82	6.7.9	£.7	42.5	•
Methylene Chloride	SMB240	0.005	mg/kg	SN	SE	0.10	0.034	0.013	0.011	0.019	0.015	
Acetone	SW8240	0.010	mg/kg	SN	SE	0.73	0.017	B 0.063	0.047	¥	0.035	
Toluene	SW8240		mg/kg	SH	SR	9	0.32	0.022	0.008	0.022	0.022	
Phenol	SW8270	0.33	mg/kg	SH	SE	0.12	2	₽	욮	2	2	
Acenaphthene	SW8270	0.33	mg/kg	S	SE	2	0.046	<u>8</u>	욮	2	2	
Fluorene	SW8270	0.33	m 0/kg	SI	S	9	0.068	2	9	2	2	
N-nitrosodiphenylamine	SW6270	0.33	mg/kg	SE	S	2	0.043	₽	윺	2	9	
Anthracene	SW8270	0.33	mg/kg	SM	S	윺	0.1	유 구	윺	9	욮	
Di-n-butylphthelate	SW8270	0.33	Mg/kg	SH	SI	0.18	1 0.61	8 0.42	B 0.13	BJ 0.38	BJ 0.14	~
Fluoranthene	SW6270	0,33	mg/kg	SN	SH	윷	0.23	2	呈	2	≆	
Pyrene	SW6270	0.33	mg/kg	SE	SH	ş	0.17	2	2	2	2	
bis(2-ethylhexyl)phthalate	SW8270	0.33	mg/kg	SN	S#	욡	0.057	090.0	0.10	9	0.050	_
Chrysene	SW8270	0.33	mg/kg	SN	SI	윺	0.054	9	윺	웊	욡	
Benzo(k)fluoranthene	SW6270	0.33	mg/kg	¥	SE	윭	0.043	9	2	욮	웆	
Benzo(a)pyrene	SW8270	0.33	mg/ kg	SM	N	9	0.046	9	9	욮	욮	
NOTES: Results reported for detected analytes only.	detected	analytes on	اح.		nalyte dete	analyte detected in blank	*	1 1 1 1 1 1 1 1	e: eoui	equipment wash blank	blank	
									•			

MD: analyte introduction limit f: field replicate
MD: analyte not detected.
MD: Allose (is detected).
MD: Allose (is detected).
MD: Allose (is detected).
MD: Allose represent most stringent standard, criteria or action level. See Appendix I.
MD: The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

for Nitrate + Mitrite given as Nitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

IABLE 4.1.15-5 (continued)

M/A X NS 14.1 14.6 10.4 27.5-29.0 37.5-39.0 M/A X NS NS 14.1 14.6 10.4 27.5 17.7 18.7 17.1 17.5 19.0 17.5-79.0 17.5-79.0 17.5-79.0 17.5-79.0 17.05/88 12.05/88 12.05/88 12.05/88 12.05/88 17.05/88 17.05/88 17.1 17.2 17.1 17.2 17.1 17.2 17.1 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17					Standards, and Action	Criteria Levels (a)	15-C-258 8AFB-0156	15-C-358 BAFB-0145	15-C-3SB BAFB-0146	15-C-3SB BAFB-0147	15-C-35B BAFB-0148	15-C-3SB BAFB-0149
Third Mark Mark	Parameter	Method	Detection	Units	Federal	State	57.5-59.0° 12/07/88	7.5-9.0 12/05/88	17.5-19.0° 12/05/88	27.5-29.0° 12/05/88	37.5-39.0° 12/05/88	47.5-49.0° 12/05/88
TFN-D1 1.0 mg/kg NS NS ND ND 30 ND 986010 20.0 mg/kg NS 10,000 86.7 199 112 ND 77 986010 10.0 mg/kg NS 10,000 86.7 199 116 173 55.5 986010 10.0 mg/kg NS 10,000 86.7 199 116 173 55.5 986010 10.0 mg/kg NS 10,000 86.7 199 116 173 55.5 986010 10.0 mg/kg NS 500 14.0 116 175 56.4 19.0 41.3 14.5 986010 3.0 mg/kg NS 2,500 14.0 46.8 79.4 46.3 31.6 46.3 31.6 46.3 31.6 41.3 46.3 31.6 46.3 31.6 41.3 41.3 41.3 46.3 31.6 46.3 31.6 41.3	Percent Moisture	ASAIP	N/A	×	SN	SI	14.1	14.6	10.4	27.8	17.1	=
TFM-GA 50 mg/kg NS HS ND ND 77 946010 20.0 mg/kg NS 10.0 10500 27,000 12500 946010 10.0 mg/kg NS 10.0 10.5 10.0 12500	TFN-Dieset	TFM-DI	1.0	mg/kg	SX	SN	2	2	9	30	2	2
9M6010 20.0 mg/kg NS NS 8670 6950 10500 27400 12500 9M6010 10.0 mg/kg NS 10,000 86.5 119 116 173 55.5 9M6010 10.0 mg/kg NS 10,000 86.5 119 116 173 55.5 9M6010 10.0 mg/kg NS 500 14.0 8 40.6 4.0 52.0 114 9M6010 3.0 mg/kg NS 8,000 4.9 6.4 19.0 62.0 41.3 14.5 9M6010 10.0 mg/kg NS 2,000 14.0 6.4 40.6 40.1	TFH-Gas	TFN-G	20	mo/kg	SE	SH	Ş	2	120	웆	2	웆
9946010 10.0 mg/kg NS 10,000 86.5 119 116 173 55.5 9946010 0.50 mg/kg NS 75 ND 0.59 ND 177 55.5 9446010 3.0 mg/kg NS 500 14.0 8.40 6.4 19.9 26.1 62.6 41.4 9446010 3.0 mg/kg NS 2,500 17.5 40.6 6.4 19.0 41.3 14.5 9446010 10.0 mg/kg NS 2,500 17.5 40.6 6.6.8 79.4 46.3 9446010 10.0 mg/kg NS 1,500 9.8 14.1 19.0 4.7 24.0 9446010 10.0 mg/kg NS NS NS NS 14.1 19.0 4.7 24.0 24.0 24.0 25.0 24.0 24.0 24.0 24.0 24.0 24.0 24.0 24.0 24.0 24.0 <th< td=""><td>Atuminum</td><td>Suc010</td><td>20.0</td><td>mo/kg</td><td>SI</td><td>SE</td><td>8670</td><td>8950</td><td>10500</td><td>27400</td><td>12500</td><td>10800</td></th<>	Atuminum	Suc 010	20.0	mo/kg	SI	SE	8670	8950	10500	27400	12500	10800
946010 0.50 mg/kg NS 75 ND 0.59 ND ND 946010 1.00 mg/kg NS 500 14.0 8 77 3480 6540 5160 946010 3.0 mg/kg NS 500 14.0 8 79.4 64.4 19.0 6540 5160 <td< td=""><td>#arica</td><td>Su6010</td><td>10.0</td><td>mo/kg</td><td>NS</td><td>10,000</td><td>86.5</td><td>119</td><td>116</td><td>173</td><td>55.5</td><td>51.1</td></td<>	#arica	Su6010	10.0	mo/kg	NS	10,000	86.5	119	116	173	55.5	51.1
SM6010 100 mg/kg NS NS 4090 2470 3480 6540 5160 SM6010 3.0 mg/kg NS 500 14.0 B 19.0 26.1 62.6 41.4 SM6010 3.0 mg/kg NS 8,000 17.5 66.8 77.4 46.5 SM6010 10.0 mg/kg NS NS 11600 B 23300 29000 54200 2860 SM6010 10.0 mg/kg NS NS 11600 S3300 29000 54200 2860 SM6010 1.0 mg/kg NS NS NS 14.1 19.0 44.7 46.5 SM6010 1.0 mg/kg NS NS NS 14.1 19.0 44.7 24.7 SM6010 1.0 mg/kg NS	Beryl i in	Stu6 010	0.50	mo/kg	SX	ĸ	욮	0.59	욮	윺	2	2
Subfollo 3.0 mg/kg NS 500 14.0 B 19.9 26.1 62.6 41.4 Subfollo 3.0 mg/kg NS 2,500 17.5 40.6 40.9 64.1 19.0 41.3 14.5 Subfollo 3.0 mg/kg NS 2,500 17.5 40.6 40.8 40.3 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.5 46.3 14.7 46.3 14.7 24.7 46.7 24.7 46.3 14.7 14.7 2	Calcium	Stu6010	5	Ma/kg	SN	SH	0607	2470	3480	6540	5160	7090
SM6010 4.0 mg/kg NS 8,000 4.9 6.4 19.0 41.3 14.5 SM6010 3.0 mg/kg NS 2,500 17.5 40.6 46.8 79.4 46.3 SM6010 10.0 mg/kg NS NS 11600 23300 29000 54200 28600 SM6010 10.5 mg/kg NS NS 343 130 735 1690 573 SM6010 1.0 mg/kg NS 2,000 9.8 14.1 19.0 44.7 24.7 SM6010 2.0 mg/kg NS NS NS 19.0 44.7 24.7 SM6010 2.0 mg/kg NS NS NS NS 24.0 32.8 SM6010 4.0 mg/kg NS <	Chromium	Stu6010	3.0	mo/kg	ST	200	14.08	19.9	26.1	62.6	41.4	25.6
SM6010 3.0 mg/kg NS 2,500 17.5 40.6 46.8 79.4 46.3 SM6010 10.0 mg/kg NS NS 11600 23300 29000 54200 28600 SM6010 10.0 mg/kg NS NS NS 130 735 1690 528.0 SM6010 4.0 mg/kg NS NS NS 14.1 19.0 44.7 24.7 SM6010 4.0 mg/kg NS NS NS NS 14.3 NS 15.2 SM6010 5.0 mg/kg NS NS NS NS 16.7 67.6 SM6010 4.0 mg/kg NS 700 ND AS 30.2 30.2 SM6010 4.0 mg/kg NS 70.0 ND AS 70.1 44.7 52.8 SM6010 4.0 mg/kg NS NS NS NS NS NS	Cobalt	Sta6010	0.4	MO/Kg	SE	8,000	6.4	6.4	19.0	41.3	14.5	13.5
SM6010 10.0 mg/kg NS 11600 B 23300 29000 54200 28600 SM6010 100 mg/kg NS NS 1620 5810 5890 9970 5283 SM6010 1.5 mg/kg NS 2,000 9.8 14.1 19.0 44.7 24.7 SM6010 4.0 mg/kg NS 2,000 9.8 14.1 19.0 44.7 24.7 SM6010 5.0 mg/kg NS 700 ND ND 61.6 107 67.6 SM6010 5.0 mg/kg NS 2,400 18.6 72.0 87.8 14.3 70.1 SM6010 2.0 mg/kg NS NS NS 72.0 87.8 14.3 70.1 SM6010 2.0 mg/kg NS NS NS 14.3 70.1 14.3 70.1 SM640 0.005 mg/kg NS NS NS	Copper	Successor 10	3.0	mo/kg	SE	2,500	17.5	9.04	46.8	7.62	46.3	47.3
SM6010 100 mg/kg NS 1620 5810 5890 9970 5283 SM6010 1.5 mg/kg NS 2,000 9.8 14.1 19.0 44.7 24.7 SM6010 4.0 mg/kg NS 2,000 9.8 14.1 19.0 44.7 24.7 SM6010 50.0 mg/kg NS 700 ND A.7 87.8 32.8 SM6010 50.0 mg/kg NS 700 ND ND 61.6 107 67.6 SM6010 2.0 mg/kg NS 2,400 18.6 72.0 87.8 143 70.1 SM6010 2.0 mg/kg NS NS 0.046 72.0 87.8 143 70.1 SM6240 0.005 mg/kg NS NS NS 0.028 0.028 0.025 0.044 SM6240 0.010 mg/kg NS NS NS NS 0.011	Iron	Stu6010	10.0	Mo/kg	SH	SH	11600 B	23300	29000	24200	28600	32700
SM6010 1.5 mg/kg NS 2,000 9.6 14.1 19.0 44.7 24.7 SM6010 4.0 mg/kg NS 2,000 9.6 14.1 19.0 44.7 24.7 24.7 SM6010 2.00 mg/kg NS NS NS 16.3 19.0 44.7 24.7 24.7 SM6010 2.00 mg/kg NS NS NS 18.3 219 504 32.8 SM6010 4.0 mg/kg NS 2,400 18.6 72.0 87.8 143 70.1 Chloride SM6010 2.0 mg/kg NS NS 0.028 0.028 0.025 0.044 32.8 Chloride SM6240 0.005 mg/kg NS NS ND ND 0.11 0.021 0.044 SMB270 0.005 mg/kg NS NS ND ND ND 0.12 0.021 0.024 0.024 0	Magnesium	SW6010	2	ma/kg	SH	SN	1620	5810	5890	9970	528)	5100
SM6010 4.0 mg/kg NS 2,000 9.8 14.1 19.0 44.7 24.7 SM6010 200 mg/kg NS NS NS 183 219 504 328 SM6010 100 mg/kg NS 700 ND 433 ND 485 302 SM6010 50.0 mg/kg NS 700 ND ND 67.6 32.8 SM6010 4.0 mg/kg NS 2,400 18.6 72.0 87.8 143 70.1 Chloride SM6010 2.0 mg/kg NS NS 0.028 0.028 0.025 0.044 SM6240 0.005 mg/kg NS NS ND ND ND 0.11 0.025 0.044 SM6270 0.33 mg/kg NS NS 0.028 0.015 0.037 0.029 0.01 0.029 0.01 0.029 0.01 0.029 0.01 0.029	Manganese	SW6010	1.5	mg/kg	SH	SN	343	130	735	1690	573	687
SM6010 200 mg/kg NS NS 558 183 219 504 328 SM6010 100 mg/kg NS 700 ND 453 107 67.6 SM6010 50.0 mg/kg NS 770 ND 61.6 107 67.6 SM6010 4.0 mg/kg NS 2,400 18.6 72.0 87.8 14.3 70.1 SM6010 2.0 mg/kg NS NS 0.014 B 52.8 70.0 37.8 70.1 Chloride SM6240 0.005 mg/kg NS NS 0.028 0.028 0.025 0.045 SMB270 0.33 mg/kg NS NS ND ND ND 0.17 0.057 J Ifphthalate SMB270 0.33 mg/kg NS NS 0.028 0.012 0.027 0.037 0.029 0.029 0.037 0.029 0.035 0.035 0	Nickel	SW6010	4.0	MO/kg	S	2,000	9.8	14.1	19.0	44.7	24.7	13.5
SM6010 100 mg/kg NS NS 558 183 219 504 328 SM6010 50.0 mg/kg NS 700 ND ND 61.6 107 67.6 SM6010 4.0 mg/kg NS 2,400 18.6 72.0 87.8 143 70.1 SM6010 2.0 mg/kg NS NS NS 0.014 B 0.026 0.025 0.025 0.044 SM8240 0.010 mg/kg NS NS NS ND ND ND 0.11 0.061 SM8240 0.005 mg/kg NS NS NS ND ND ND 0.11 0.045 Alphthalate SM8270 0.33 mg/kg NS NS NS ND ND ND ND 0.057 J Alphthalate SM8270 0.33 mg/kg NS NS 0.083 J 0.12 J 0.29	Potassium	SW6010	200	2 /kg	SH	SH	2	433	욮	485	302	315
Suk6010 50.0 mg/kg NS 700 ND ND 61.6 107 67.6 Suk6010 4.0 mg/kg NS 2,400 18.6 72.0 87.8 143 70.1 Suk6010 2.0 mg/kg NS NS NS 0.014 B 0.025 0.025 0.044 Suk240 0.005 mg/kg NS NS NS ND ND 0.11 0.045 Suk240 0.005 mg/kg NS NS NS ND ND 0.11 0.044 Alphthalate Suk270 0.33 mg/kg NS NS ND ND ND 0.057 J Alphthalate Suk270 0.33 mg/kg NS NS ND ND ND 0.057 J NIChhthalate Suk270 0.33 mg/kg NS NS 0.085 J 0.028 J 0.037 J 0.087 J	Sodium	SW6010	5	mo/kg	SI	SE	558	183	219	504	328	335
SM6010 4.0 ng/kg NS 2,400 18.6 72.0 87.8 143 70.1 SM6010 2.0 ng/kg NS 5,000 31.8 51.3 58.7 96.1 52.8 SM8240 0.005 ng/kg NS NS NS 0.014 0.025 0.025 0.044 SM8240 0.005 ng/kg NS NS NS ND ND 0.11 0.024 SM8270 0.005 ng/kg NS NS NS ND ND ND ND 0.057 J Alphthalate SM8270 0.33 ng/kg NS NS NS ND ND ND 0.057 J Alphthalate SM8270 0.33 ng/kg NS NS NS 0.083 J 0.12 J 0.029 J 0.097 J 0.087 J 0.045 J 0.045 J 0.085 J 0.087 J </td <td>Thattie</td> <td>Su6010</td> <td>50.0</td> <td>20/kg</td> <td>SR</td> <td>8</td> <td>2</td> <td>2</td> <td>61.6</td> <td>107</td> <td>67.6</td> <td>⊋</td>	Thattie	Su6010	50.0	20/kg	SR	8	2	2	61.6	107	67.6	⊋
SM6010 2.0 mg/kg NS 5,000 31.8 B 51.3 58.7 96.1 52.8 substance SM8240 0.005 mg/kg NS NS 0.014 B 0.028 0.030 0.025 0.044 substance SM8240 0.010 mg/kg NS NS 0.021 0.11 0.022 0.011 0.061 viphthalate SM8270 0.33 mg/kg NS NS ND ND ND ND 0.057 J riphthalate SM8270 0.33 mg/kg NS NS NS ND ND ND 0.057 J viphthalate SM8270 0.33 mg/kg NS NS 0.083 J 0.12 J 0.37 BJ 0.29 BJ vythavyl)phthalate SM8270 0.33 mg/kg NS NS 0.065 J 0.085 J NO 0.32 J 0.087 J	Vanadium	Stat6010	4.0	MQ/kg	SE	2,400	18.6	72.0	87.8	143	70.1	72.4
ne Chloride SM8240 0.005 mg/kg NS 0.014 B 0.028 0.037 0.011 0.044 SM8240 0.010 mg/kg NS 0.021 0.11 0.022 0.011 0.061 sud240 0.005 mg/kg NS NS 0.021 0.11 0.022 0.011 0.064 J sodfphenylamine SM8270 0.33 mg/kg NS NS ND ND ND ND 0.057 J typhthalate SM8270 0.33 mg/kg NS NS 0.045 J 0.085 J 0.12 0.37 B 0.29 B ttylhexyl)phthalate SM8270 0.33 mg/kg NS NS 0.045 J 0.085 J 0.032 J 0.087 J	Zinc	State 010	2.0	MQ/kg	S	2,000	31.8 B	51.3	58.7	8.1	52.8	54.5
SMB240 0.010 mg/kg NS 0.037 B ND ND 0.11 0.061 sud240 0.005 mg/kg NS 0.021 0.11 0.022 0.011 0.004 J sud270 0.33 mg/kg NS NS ND ND ND ND 0.057 J typithelete SMB270 0.33 mg/kg NS NS 0.085 J 0.12 J 0.37 BJ 0.29 BJ thylhexyl)phthalate SMB270 0.33 mg/kg NS NS 0.065 J 0.085 J ND 0.32 J 0.087 J	Methylene Chloride	SM8240	0.00	mo/kg	SZ	SE	0.014 B	0.028	0.030	0.025	0.044	0.057
SMB240 0.005 mg/kg NS 0.021 0.11 0.022 0.011 0.004 J adiphenylamine SMB270 0.33 mg/kg NS NS ND ND ND 0.057 J tylphthalate SMB270 0.33 mg/kg NS NS 0.083 J 0.28 J 0.12 J 0.37 BJ 0.29 BJ thylhaxyl)phthalate SMB270 0.33 mg/kg NS NS 0.045 J 0.085 J ND 0.32 J 0.087 J	Acetone	SM8240	0.010	MQ/kg	S	S¥	0.037 B	€	웊	0.11	0.061	0.086
acdiphenylamine SMB270 0.33 mg/kg NS NS ND ND ND 0.057 J tylphthalate SWB270 0.33 mg/kg NS NS 0.083 J 0.28 J 0.12 J 0.29 BJ thylhaxyl)phthalate SWB270 0.33 mg/kg NS NS 0.045 J 0.085 J ND 0.32 J 0.087 J	Toluene	SW8240	0.002	MO/Kg	SH	SH	0.021	0.11	0.022	0.011	0.00	J 0.003 J
SMB270 0.33 mg/kg NS NS 0.083 J 0.12 J 0.37 BJ 0.29 BJ thelate SMB270 0.33 mg/kg NS NS 0.045 J 0.085 J ND 0.32 J 0.087 J	N-nitrosodiphenylamine	SH6273	0.33	MQ/kg	SZ	SN	2	2	윺	2	0.057	J 0.051 J
thelate su6270 0.33 mg/kg MS MS 0.045 J 0.085 J MD 0.32 J 0.087 J	Di-n-butylphthalate	SUB270	0.33	Mo/kg	SZ	SH	0.083	0.28	0.12	J 0.37	BJ 0.29	BJ 0.12 BJ
	bis(2-ethylhexyl)phthalate	SW6270	0.33	#Q/kg	S	SE	0.045	0.085	9	0.32	1 0.087	J 0.11 J

e: equipment wash blank f: field replicate R: resample

for Witrate + Witrite given as Witrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. MOTES: Results reported for detected analytes only.

MI: analyte not tested

MD: analyte not detected.

MD: detected in blank filled replicate in the filled replicate analyte detected.

MD: field blank family filled replicate filled replicate analyte detected in blank filled replicate analyte analyte detected in blank)

MD: values represent most stringent standard, criteria or action level. See Appendix I.

MD: nalyte detected in blank filled replication as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l

IABLE 4.1.15-5 (continued)

toisture				1 action 1	(a) alawal		BAER-0157	BAFB-0158	RAFR-III>	BAFETUDO	RAFR-0161
foisture				AND ACCION	(a) e1242.	_	7 5-0 01	0 0-10 5	17.5-19.0	27.5-29.0	37.5-39.0
Percent Noisture	Method	Detection Limit	Units	Federal	State	12/05/88	12/07/88	12/07/88	12/07/88	12/07/88	12/07/88
	ASAMO	4/8	×	SI	SE	10.0	2	21.9		19.2	
	646	2 0	mo/ka	S	S	10000	14800	18700	10500	13100	11000
	01030	10.0	a/ka	S	10,000	6.97	218	152		69.1	
	246010	100	mo/ko	SE	SE	720	5340	2690		4260	
Chronita	546010	3.0	mo/ka	SN	200	33.7	37.4	3 51.3		8 35.6	
Cobalt	010978	7.0	mo/ko	SE	8,000	10.0	21.3	17.9		18.6	
11000	SU6010	, M	ao/ko	SE	2,500	38.0	59.8	61.5		45.8	
1.00	SLASOTO	֭֓֞֞֜֜֝֞֜֝֜֝֞֜֜֝֝֓֓֓֞֜֜֝֜֜֜֝֓֓֓֓֓֓֓֓֓֜֜֜֜֝֡֓֡֓֡֓֜֜֜֜֜֜֡֡֡֡֓֜	/ko	S	SE	25700	26000	30500		B 23800	
To an	010348	5	o/ko	S	S	3630	200	238		6340	
The second second	010978		6/ko	SM	S	397	1030	265		207	
10 10 10 10 10 10 10 10 10 10 10 10 10 1	010978	. 4	o/ko	S	2.000	18.9	30.4	39.1		28.0	
Dot be sell	Suco 10	200	/ko	SE	SH	226	363	397		804	
Sodiu	SW6010	100	mo/ka	SN	SZ	262	18 88	558		<u>\$</u>	
Theilin	SUKO10	20.0	ø/ko	S	902	윺	욮	웊		욯	
Vacadium	Su6010	4.0	mo/ka	SE	2,400	76.9	59.5	52.0		8 .02	
Zinc .	Su6010	2.0	mo/ko	SH	2,000	38.8	78.3	8 73.8		8 56.6	
Methylene Chloride	SM6240	0.005	a/kg	SM	SI	0.010	0.023	9 0.005	2	B 0.014	
Acetone	SM6240	0.010	mo/ko	SH	SZ	0.033	0.036	B 0.026	_	8 0.40	
2-Butanone	SW8240	0.010	20/k 9	SE	SH	욮	2	0.008	_	۽	
4-Methyl -2-Pentanone	SUB240	0.010	Me/kg	SN	SX	욡	身	0.003	_	0.00	
Toluene	S18240	0.005	mo/kg	SE	SE	0.003	0.038	0.023		0.007	
Di-n-butvirhthelete	5723	0.33	mo/ka	SE	SH	0.29	2	윺		웊	
bis/2-ethylhexyl)ohthelete	223	0.33	mo/ko	SE	SI	0.18	9	2		윺	

NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

ND: field blank (ambient condition blank)

R: resample

R: resample

R: resample

R: resample

R: resample

R: resample

ND: mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

For Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

1ABLE 4.1.15-5 (continued)

				Standards,	Criteria Levels (a)	15-C-458 RAFR-0162	15-C-458 8AFR-0163	15-C-558 RAFR-0082	15-C-5SB BAFB-0083	15-C-5SB BAFB-0084	15-C-5SB BAFB-0085
		Detection				47.5-49.0	57.5-59.0	10.0-11.5	20.0-21.5	30.0-30.7	40.0-41.0
Parameter	Method	Limit	Laits	Federal	State	12/00/88	12/06/88	00/06/11	00/06/11	00/06/11	90/06/11
Percent Moisture	ASAMO	Y/N	*	SN.	SE	13.8	19.1	11.7	16.4	12.9	16.5
162-500	TFN-GA	20	ma/ka	SI	SN	9	2	2	윺	69	욜
	010975	20.0	mo/ko	SE	SM	86 70	9800	0%6	17900	9450	17500
	Succession of the succession o	10.0	mo/ko	SZ	10,000	7.87	168	9.87	136	¥	133
	or OAM	9	pa/ka	SI	SZ	3480	3830	0984	9779	0797	7260
	SLASO TO	3.0	0/ko	SE	200	27.4	26.8	25.3	40.1	19.5	14.4
in the contract of the contrac	SUKO10	0.4	o/ko	SE	8,000	17.4	29.9	12.5	29.5	11.5	21.6
11800	SLAKO10	, p	04/kg	S	2,500	39.2	43.3	34.2	 \$	33.8	24.0
Los	200	5	o/ko	S	SE	22900	25600	24200	38200	22800	26700
Total in	STOWN OF COLUMN	9	o/ko	S	S	6360	6280	4750	7690	4550	3370
Management	SLASO10		o/ko	S	S	553	1510	447	1180	375	265
Hi Chai	SLKO10	9	pa/ka	S	2,000	17.4	23.5	12.5	29.1	11.5	20.4
Dotpesion	Success	500	p/ka	SE	SE	452	Ē	288	437	274	334
Codin	SUKOTO	9	po/ka	SZ	SE	161	3	163	227	707	757
- Section	SUKOTO	4	wo/ko	S	2.400	76.2	72.4	8.8	102	67.6	58.4
2195	CLOALS OTO	2.0	o/ko	S	2,000	51.2	59.5	59.5	8 70.1	B 40.5	8 52.2
Machylone Chloride	0100ms	0.05	o/ko	S	SE	0.073	0.084	0.023	B 0.040	B 0.011	B 0.024
Acatoo	070975	010	2/kg	S	S	2	욮	0.037	8 0.58	8 0.008	B 0.19
Tolume	072875	0.005	o/ko	S	S	0.020	0.043	0.012	6 0.017	9	0.047
2004	CL6270	0.33	oy/ko	SE	SE	2	3	1.4	8 1.8	8 2.0	9 1.6

MOTES: Results reported for detected analytes only.

Wit: analyte rot teated
Wit: analyte rot teated
Wit: analyte rot teated
Wit: analyte rot teated
Wit: analyte rot detected.
Wit: an

				Standards, and Action	Standards, Criteria and Action Levels (a)	15-C-5SB BAFB-0086 FO 0-F1 F1	
Parameter	Method	Detection Limit	Units	Federal	State	11/30/88	
Percent Moisture	ASA#9	V/R	*	SE	SN	16.3	
	010978	20.0	mo/ka	SE	SE	12500	
	Serko10	10.0	a/ka	S	10,000	95.0	
	S16010	90	o/ka	SE	SE	3870	
	246010	3.0	ø/ka	ST	200	9.1	
Cobelt	010348	7.0	a/ko	SH	8,000	10.6	
	010978	3.0	mo/ka	SE	2,500	21.5	
100	S16610	10.0	mo/ko	N.	SE	22300	
Magnes in B	010	001	p/ka	SH	SE	2840	
	SLK010	5	o/ka	S	XX	11.7	
	SUKO10	0.4	o/ka	S	2.000	13.1	
	SLK010	200	/ka	S	SH	335	
Sodium	Succession	100	mo/ka	R	SN	385	
100 m	204030	50.0	pa/ka	SZ	82	68.5	
	SU6010	0.4	%/¢	SE	5,400	42.8	
2 inc	SUK010	2.0	mo/ko	ES.	2,000	47.78	
Methylene Chloride	S140240	0.005	mo/kg	SZ	SH	0.015 B	
Acatona Acatona	SU#240	0.010	Mo/kg	SH	SH	0.118	
Tolumne	SIMB240	0.002	Zo/kg	SH	SH	0.027 8	
Phenol	SW8270	0.33	10 /kg	W.	SE	2.08	
MOTES: Results reported for detected	r detected	analytes only.	nly.	# # # # # # #			•
NT: analyte not tested						analyte detected in blank perimeted value below quantification limit	e: equipment wash blank mit f: field replicate
MD: Gralyte not detected. NS: No atandard criteria or action level currently exists.	r action L	evel curren	tly exists	ت :	field blank	field blank (ambient condition blank)	

TABLE 4.1.15-5

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

Parameter	Rethod	Detection Limit	Units	Standards, Ci and Action Li Federal	Criteria Levels (a) State	15-A-1GW BAFB-0515 03/30/89	15-A-2GW BAFB-0514 03/30/89	15-A-3GW BAFB-0512 03/30/89	15-A-4GW BAFB-0510 03/29/89
Cracific Conductivity	F120 1	0.0	myos/ce	S	906	285	252	210	220
Temperature	£170,1	**	open C	Ş	SX.	19.5	20.8	19.2	19.0
7	E150.1	4/	7	2-6	SN	7.8	7.65	8.10	8.12
Alkalinity - Total	204403	1.0	7	2	SZ	102.0	92.2	8.0	8 0.0
Bicarbonate	S14603	1.0	Ž	SI	SH	124.4	112.5	115.9	97.6
Total Dissolved Solids	E160.1	3.0	7	200	200	232	221	198	90 2
Chloride	E325.3	1.0	Ž	250	220	23.3	18.2	15.0	10.2
Fluoride	E340.2	0.050	7	7	1.4	¥.0	0.31	0.37	0.36
Eitrate + Eitrice	£353.3	0.050	7	10	45	12.0	5.3	8.0	6.8 8
Sulfate	E375.4	1.0	7	250	250	18.1	16.7	5.7	6.4
Areenic	090ZFS	0.0020	Ž	ક	રું.	윺	욮	0.0050	0.0050
Calcium	Su6010	9.5	/o	SZ	SH	16.6	7.72	16.6	19.1
Megnesium	Su6010	00.1	7	SZ	SH	5.2	9.60	5.52	8.4
Potagaium	Su6010	1.00	7	SZ	SH	1.20	1.30	1.70	1.70
Sodium	Su6010	1.00	7	S¥	SX	41.2	20.7	23.6	56.6
Zine	Su6010	0.0500	7	0,110	0.012	5	Ş	0.0320	줥

NOTES: Results reported for detected analytes only.

HI: analyte not tested

HI: analyte not detected.

HI: analyte not detected in limits are for detection limits.

HI: analyte not detected in limits for each analysis are given in Appendix A.

e: equipment wash blank f: field replicate R: resample

TABLE 4.1.15-5

BEALE AFB: WATER DATA 2ND ROUND SAMPLING 1989

				Standards, Cri	Criteria	15.4.16.	15.4.3011		15.7	
Perameter	Method	Detection Limit	Units	Federal	State	BAFB-0553 05/26/89	BAFB-0550 05/25/89	BAFB-0551 05/26/89	BAFB-0552 05/26/89	
Specific Conductivity	E120.1	1.0	umbos/cm	SR	8	&	255	222	227	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Temperature	E170.1	4/ 8	des c	SN	Ş	21.0	20.5	20.5	20.5	
₹.	E150.1	K / H	₹	6-5	SE	7.69	7.50	8.73	9.33	
Alkalinity - Total	SP4 03	1.0	7	2	Ş	7.3	8.0	92.0	8.76	
Bicarbonate	SPK 03	1.0	7/0	SN	Ş	115.2	117.1	112.2	115.7	
Total Dissolved Solids	E160.1	3.0	7	200	8	544	232	202	208	
Chloride	E325.3	1.0	Ž	9 22	8 8	23.4	17.7	13.9	6.6	
Fluoride	E340.2	0.050	7/0	~	1:4	0.56	0.23	0.29	0.31	
Mitrate + Mitrite	E353.3	0.050	<u> </u>	10*	\$	12.5	5.0	8.5	8.1	
Sulfate	E375.4	1.0	7	520	22	22.0	19.6	1.8	8.1	
Calcium	SW6010	1.00	7	S#	S	16.0	23.1	13.8	14.0	
Magnesium	SW6010	1.00	Ž	S	SE	86.4	8.7	67.7	4.01	
Manganese	Su6010	0.0150	Š	ş	S.	皇	0.0240	₽	9	
Potassium	Su6010	-8	<u>></u>	SE	SE	2	1.30	2.40	2.30	
Sodium	SW6010	. 8	~ 2	SH	¥	37.5	18.0	22.8	25.0	
Toluene	SIMB020	-	7	14,300	5	133	1(0)	1(0)	2(0)	
1,4-Dichlorobenzene	SHB020	-	7/00	ĸ	ĸ	2	9	8	9	
N-Witrosodiphenylamine (1)	SMB270	2	7/80	SH	SE	7	<u></u>	2		
bis(2-Ethylhexyl)Phthalate	SW8270	2	1/80	S	S	9	vo	2	m	

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NT: analyte not tested ND: analyte not detected. NS: No standard criteris or action level currently exists. NOTES: Results reported for detected analytes only.

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Mitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.15-5

BEALE AFB: MATER DATA 3RD ROUND SAMPLING 1989

		•		Standards, and Action	Criteria Levels (a)	15-A-1GW	15-1-2GV	15-A-2GW	15-A-26W	15-A-2GW	15-A-3GN
Parameter	Method	Detection Limit	Units	Federal	State	08/29/89	08/53/89	08/29/89	08/29/89	08/29/89	08/30/89
Specific Conductivity	E120.1	1.0	Carbos/Car	SE	8	288	•		X	T.N.	210
Temperatura	E170.1	W/W	Open C	SE	SZ	20.5			=	12	21.0
	E150.1	4/8	7	5.9	S	8.05	7.98	7.98	Ħ	Ħ	\$. \$
Alkalinity - Total	20403	1.0	/02	2	SH	100.0			Z	×	33.4
Bicarbonete	50403	1.0	7	SE	KS	122.0		-	Ŧ	H	101.7
Total Dissolved Solids	£160.1	3.0	1/02	200	200	549			24.0	×	213
Chloride	£325.3	1.0	1	250	250	23.5			윷	=	13.4
Firstide	E340.2	0.050	1/02	7	1.4	0.23			0.060	Ħ	0.27
Mitrote + Mitrite	E353.3	0.050	7	•	53	14.2			0.93	Ħ	9.0
Sulfate	E375.4	1.0	2	250	250	20.3			2	Ħ	9.6
Chamical Oxygen Demand (COD)	E410.4	7.0) 	SH	SE	7.4			Ş	¥	9
Calcium	Su6010	1.8	1/04	SE	SH	17.2			9	Ħ	15.2
Magnesium	SU6010		I/OW	SN	SX	5.53			욮	Ħ	5.30
Potassium	SW6010	1.00	1/02	SE	S	₽			2	Ξ	<u>.</u> 2.
Sodie	S16010	1.00	2	SE	SH	41.9			욯	¥	25.9
Methylene chloride	540010	•	3	SE	SZ	2			140(150)	140(150)	9
M-Mitrographenylamine (1)	SLB270	5	3	SE	SE	9	_	9 (9	97	BJ NT	
bis(2-Ethylhexyl)Phthelate	SW6270	2	1/87	SX	SN	7		60	J 23	K	ş
								16000000000			*********

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MO: analyte not detected.

MO: analyte not detected in () analyte standard, criteria or action level. See Appendix I.

The faderal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is aqual to the State of California Standard of 45 mg/l

for Mitrate + Mitrite given as Mitrate.

Detection (imits are for dilution = 1.0 and represent target detection (imits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.15-5 (continued)

		•		Standards, Criteria and Action Levels (a)	evels (a)	15-A-4GW
Parameter	Method	Detection Limit	Units	Federal	State	BATE-0014 08/30/89
Specific Conductivity	E120.1	0.1	umpos/cm	SN	8	215
Temperature	£170.1	W/W	Oeg C	SN	SH	21.0
-	E150.1	K/N	Ŧ	2-9	SN	8.83
Alkalinity - Total	204403	1.0	1/04	2	SZ	7.76
Bicarbonate	SPK 03	1.0	1/01	SZ	SE	118.8
Total Dissolved Solids	E160.1	3.0	1/0	200	200	226
Chloride	E325.3	0.1	/	220	250	13.4
Fluoride	E340.2	0.050	1/0	7	1.4	0.29
Mitrate + Mitrite	£353.3	0.050	/	10*	5	7.2
Sulfate	E375.4	0.7	/0	250	250	10.3
Arsenic	0907HS	0.0020	1/0	S	ક	0,0060
Calcium	SW6010	8.	7/02	SE	SH	15.8
Megnes ium	Sta6010	5.	7/2	Ş	NS	5.10
Potassius	Stu6010	5.	1/2	SE	SE	2.00
Sodium	St.6010	9.1	1/2	SH	SE	27.4

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MS: analyte for detected

MS: analyte not detected

MS: analyte not detected.

MS: analyte not detected.

MS: analyte not detected.

MS: As tandard criteria or action level currently exists.

MS: No standard criteria or action level. See Appendix I.

MS: No standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

MS: No standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l betection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

TABLE 4.1.15-5

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

Method E120.1 E170.1 E170.1 SM403 SM403 E160.1 E160.1	Limit Limit 1.0	Units shos/cm deg C pH mg/l	Federal NS NS NS S-9 20 20 20 250 250	State 900 88	BAFB-0695 11/18/89	BAFB-0694	BAFB-0697	BAFB-0700
E120.1 E170.1 E150.1 \$#63 \$#63 E160.1	0440000	mhos/cm deg C pH mg/L	250 20 20 250 250	906 SN SN	1 1 1 1 1 1 1 1 1 1	222	11/19/89	11/20/89
E170.1 E150.1 SM403 SM403 E160.1 E160.1	**	2 4 7 m	5-9 20 80 80 80 80 80 80 80 80 80 80 80 80 80	SZ	586	250	215	
E150.1 88403 88403 E160.1 E325.3	¥0.000	£ 7	500 8 8 0 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	SI	20.5	19.0	21.0	
8#403 8#403 E160.1	0000	Ž	20 800 250		8.06	7.80	8.50	
swk03 ved Solide E160.1 E255.3	- w -		S 80 250 250	SN	97.6	93.2	8.3	
E160.1 E325.3	0.0 0.0	7	22 22 28	SE	119.1	113.7	115.7	
E325.3	-	7	220	200	232	242	189	
	?	7		250	22.9	17.0	13.1	
7.0K	0.050	7	~	1.4	0.29	0.24	0.32	
£353.3	0.050	7	<u>.</u>	45	10.5	4.4	8.2	
E375.4	1.0	7	220	250	15.8	17.4	3.3	8.4
TFH-DI	0.050	7/2	SI	SZ	ş	윺	2	
Sta6010	8.	7	SE	SZ	17.4	26.1	14.7	
Su6010	8.	/	SH	S.S.	2.40	8.67	8.4	
m Su6010 0	.0400	7	SZ	SZ	0.0400	2	9	
Su6010	 8	7	SE	SZ	1.1	1.33	1.91	
St#6010	9.	/	SN.	SR	41.2	20.6	25.8	
SMB020	,-	7	14,300	5	131	2	유	
	5	7/65	SH	SH	9	2	윺	
	9	7/85	NS	SN	~	2	•	7
Di-n-Butylphthalate SuB270	2	1/87	SE	SE	웆	€	₽	
	2	7	SH	SH	•	'n	•	7

e: equipment wash blank f: field replicate R: resample

MOTES: Results reported for detected analytes only.

MT: analyte not tested

MT: analyte not tested

MT: analyte not tested

MT: analyte not tested

MT: analyte not detected

MT: analyte not detected in limit

MT: analyte detected in blank

MT: analyte not detected in limit

MT: detected in limit

MT: detected in limit

MT: detected in limit

MT: field blank

MT: field replication

MT: fiel

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. for Mitrate + Mitrite given as Mitrate.

Table 4.1.15-6
RANGES OF CONTAMINANTS DETECTED AT SITE 15

CONTAMINANT		HINIMUM	MUMIXAN	# DETECTIONS/
ANALYTE	UNITS	CONC.	CONC.	# SAMPLES
SOIL BORINGS		••••••		
TFH-diesel	mg/kg	ND	30	1/29
TFH-gas	mg/kg	ND	120	3/29
toluene	mg/kg	ND	0.32	26/29
bis(2-ethylhexyl) phthalate	mg/kg	ND	(0.32)	6/29
di-n-butyl phthalate	mg/kg	ND	(0.34)	8/29
n-nitrosodiphenylamine	mg/kg	ND	(0.057)	3/29
GROUNDWATER				
arsenic	mg/l	ND	0.006	3/16
TFH-diesel	mg/l	ND	0.090	1/16
LANDFILL GAS				
dichloromethane	ppbv	4500	4500	1/1
1,1,1-trichloroethane	ppbv	68	68	1/1
1,2-dichloroethane	ppbv	100	100	1/1
trichloroethene	ppbv	880	880	1/1
tetrachloroethene	ppbv	830	830	1/1
AMBIENT AIR				
dichloromethane	ppby	3.0	3.0	1/1
1,2-dichloroethane	ppby	1.1	1.1	1/1
benzene	ppby	2.4	2.4	1/1
carbon tetrachloride	ppby	0.22	0.22	1/1
trichloroethene	ppbv	2.5	2.5	1/1
tetrachloroethene	ppbv	0.84	0.84	1/1

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. These detections may represent laboratory "noise," and some analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study, the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

- 4.1.15.2 Sampling and Analytical Problems
- 4.1.15.2.1 Loss of Samples

There were no sample loss problems for Site 15 samples. Additionally, there were no holding time violations that required resampling and no scheduled analyses were missed.

4.1.15.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil and water samples collected at Site 15 contained several organic compounds that were probably laboratory— or field-induced false positive results. Phenol was detected in 11 of the soil samples at concentrations of 0.097 mg/kg to 2.2 mg/kg. This has been traced to a factory-contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Many of the soil samples collected also contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks at similar levels.

In several of the soil samples, the semivolatile compounds di-n-butyl phthalate, and n-nitrosodiphenylamine were estimated below the LOQ and were also found in some of the method blanks at similar levels.

Toluene was detected in all but 3 of the 29 soil samples. The maximum concentration was 0.32 mg/kg, with most of the detected concentrations below 0.12 mg/kg. Toluene is not considered a common lab contaminant but was detected in at least one associated laboratory blank. The ubiquitous distribution makes the results suspect as positive detections.

One group of semivolatile organic compounds was detected in a sample from soil boring 15-C-2SB, at a depth of 11.5 to 13.0 feet (10 to 11 feet vertically). Although this may represent positive contamination, all of the compounds were tentatively identified at concentrations below the LOQ.

Two soil replicate samples were collected at Site 15. A comparison of results for the environmental samples versus the corresponding replicate samples shows that the analysis results are very similar. Some variability exists for metals in the soil samples, but this is expected because the two samples were not combined and homogenized in order to minimize loss of volatile compounds.

Arsenic was detected at the LOQ (0.005~mg/l) in wells 15-A-3 and 4 in the first quarterly sampling. It was not detected in the method blank. Arsenic was not detected in the second or fourth rounds but was detected in the third round in well 15-A-4 at 0.006~mg/l.

In the third quarterly sampling at well 15-A-2, methylene chloride was not detected in the normal environmental sample or the replicate sample. However, methylene chloride was detected in both the ambient condition blank and the equipment wash blank. This has been traced to contaminated Type l organic free water which occurred in a number of blanks during the third sampling round. In each case, the normal environmental sample did not contain methylene chloride but the blanks did.

N-nitrosodiphenylamine was estimated below the LOQ in both the water sample and method blank for wells 15-A-1, 15-A-2, and 15-A-3 and also in the replicate and equipment wash blank for 15-A-2 in the third quarterly sampling round. Di-N-Butylphthalate was detected below the LOQ in both the sample and the associated method blank for 15-A-4.

4.1.15.2.3 Analytical Results Obtained under Out-of-Control Conditions

In the third quarterly sample of well 15-A-4 the phenol-d5 surrogate spike for 8270 analysis exceeded allowable percent recovery limits by 16 percent. No chemicals were detected in the analysis.

In the fourth quarter 8270 analyses of groundwater samples, the following surrogate spike recoveries were below their acceptable ranges: Nitrobenzene-D5 was 33 percent in 15-A-1 and 15 percent in 15-A-3 (below the 35 to 114 percent

range), 2-Fluorobiphenyl was 40 percent in 15-A-1, 39 percent in 15-A-2, and 22 percent in 15-A-3 (below the 43 to 116 percent range).

4.1.15.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.15.3 Significance of Findings

Soil

In the four angled borings and one background boring drilled at Site 15, no organic compounds were detected above the LOQ in soil samples except for those compounds considered to be false positives. The only potential contaminants quantified were TFH-diesel and -gas. TFH-diesel was detected at 30m g/kg in the 28-foot sample (24 feet vertically) from boring 15-C-3SB. TFH-gas was detected at 120 and 77 mg/kg in the 18- and 38-foot samples (16 and 33 feet vertically) from 15-C-3SB and at 69 mg/kg in the 30-foot sample from 15-C-5SB (background boring). The LUFT cleanup standards computed for these specific sample locations are 1,000 mg/kg for TFH-diesel, and 100 mg/kg for TFH-gas. TFH-gas detected at 18 feet in 15-C-3SB at 120 mg/kg is the only case which exceeds these standards.

A suite of 10 semivolatile organics was tentatively identified below the LOQ in the 12-foot sample (10 feet vertically) from 15-C-2SB. These organic compounds may have migrated into the soil from materials in the wood pit.

Aluminum, barium, beryllium, chromium, magnesium, and sodium were detected at levels greater than two standard deviations above the averaged background soil boring values. All detections were at levels below the respective DHS TTLC values.

Groundwater

Wells installed at Site 15 were all completed during previous investigations. The sandstone observed at the Site 6 background well (6-C-1, 2,800 feet to the west of the three western Site 15 wells) was not logged in any of these Site 15 wells. Although consolidated materials (shale in 15-A-4) were specifically identified in only one well log, it is possible that the subangular gravel described near each hole bottom was actually the beginning of consolidated formations. This is supported by the low well yields at Site 15.

General water quality parameters were at approximately the same levels in all the wells at Site 15 and do not indicate the presence of contamination. No organic compounds were detected in the groundwater at Site 15 except the single detection of TFH-diesel at 0.090 mg/l in the fourth round at 15-A-4. Arsenic was found at the 0.005 mg/l LOQ in samples from wells 15-A-3 and 15-A-4 in the first round, and at 0.006 mg/l in 15-A-4 in the third round. It is most likely that the arsenic, if present, is naturally occurring in the groundwater, as arsenic was not detected in the soil borings. The DHS primary MCL for arsenic is 0.050 mg/l.

Surface Water

Surface water is not present near Site 15 and was not sampled.

Air

An OVA was used to screen landfill gas concentrations above the soil cap at four locations in the approximate center of the landfilled area, with the highest concentration being 100 ppm. Screening measurements in soil vapor wells installed around the landfill at four locations indicated organic vapors at levels of 7.0, 7.5, 13.0, and 26.0 ppmv, with the highest concentration measured at the northern side of the landfill. Two soil vapor concentrations exceeded the background (upwind) ambient air concentration of 8 ppm. Local variations in natural soil vapor could account for the concentrations measured.

The landfill gas sample collected from the landfill gas monitoring well installed into the landfill contained dichloromethane, 1,1,1-trichloroethane, 1,2-dichloroethane, trichloroethene, and tetrachlorethane at concentrations ranging from 68 ppbv (380 ug/cubic meter) for 1,1,1-trichloroethane, to 4,500 ppbv (16,000 ug/cubic meter) for dichloromethane. The fixed gas analysis for hydrogen, nitrogen, oxygen, methane, carbon monoxide, and carbon dioxide accounted for only 79.2 percent of the sample volume.

The downwind, 24-hour ambient air sample (Table 4.1.15-3) contained four of the five compounds detected in the land-fill gas sample (4.5 to 14 ug/cubic meter), with 1,1,1-trichloroethane being the only one of the five compounds not detected. In addition to these four compounds, the ambient air sample also contained benzene and carbon tetrachloride (7.8 and 1.4 ug/cubic meter, respectively), which were not found in the landfill gas sample.

It is concluded that Site 15 is generating landfill gas in the form of methane, carbon dioxide, and chlorinated volatile organics. Oxygen concentration in the landfill gas monitoring well is less than 2 percent, indicating that as the refuse materials degrade, exygen is being depleted and anaerobic conditions may prevail in the future. Although four of the five compounds detected in the landfill gas sample were also detected in the downwind ambient air sample, it cannot be concluded that the sole source of these compounds is Landfill No. 3. Benzene and carbon tetrachloride were also detected in the ambient air sample but not in the landfill gas. The source of these compounds is unknown.

4.1.15.3.1 Zones of Contamination

On the basis of soil borings drilled at Site 15 during Stage 2-1, the only signs of soil contamination detected were the semivolatile organic compounds tentatively detected below the LOQ in 15-C-2SB and the isolated detections of TFH-diesel and -gas.

Based on groundwater sampling conducted during two stages of IRP work, no indications of contamination have been detected in the groundwater except the single detection of TFH-diesel at 0.090~mg/l in the fourth round at 15-A-4.

4.1.15.3.2 Contaminant Migration

Contaminant migration is not expected in soil or groundwater at Site 15. Evidence from the Stage 2-1 study indicates no significant contamination in groundwater at Site 15.

Although four of the five compounds detected in the landfill gas sample were also detected in the downwind ambient air sample, it cannot be concluded that the sole source of these compounds is Site 15. Based on the emission screening, there does seem to be some leakage from the landfill soil cover; however, the quantity of gas escaping is unknown. The combined concentration of gases detected in the downwind sample is less than I percent of the background organic vapor concentration measured upwind of the landfill. If the Attachment I gases detected downwind are from the landfill, they appear to contribute very little to the total organic vapor concentrations.

4.1.15.3.2.1 Potential to Move Off Site and Off Base

Measurable contaminant migration is not expected from Site 15. No significant contamination has been detected in the groundwater.

4.1.15.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

No contaminants were detected in the groundwater samples collected at Site 15 monitoring wells in the IRP Phase II, Stage 1 or Stage 2-1 studies except the single detection of TFH-diesel at 0.090 mg/l in the fourth round at 15-A-4. Since the landfill is an active facility, groundwater monitoring should continue at the site. The presence of TFH-diesel in 15-A-4 needs to be evaluated with future sampling. Should contaminants migrate from the landfill into the groundwater they would move with groundwater generally to the west.

4.1.15.3.2.3 Time of Travel to Receptors

Significant contaminant migration is not expected from Site 15 based on information from the IRP studies.

4.1.15.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable because no significant contaminants were detected in the groundwater wells at Site 15.

4.1.15.3.2.5 Expected Spatial and Temporal Variations in Concentration

Based on present conditions, spatial or temporal variations are not expected in concentrations from Site 15 apart from groundwater at well 15-A-4 which needs to be sampled to evaluate TFH-diesel variations in the future.

4.1.15.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.16 DISCUSSION OF RESULTS FOR SITE 16: EXPLOSIVE ORDNANCE DISPOSAL AREA

The Explosive Ordnance Disposal (EOD) area is in a remote area off a series of dirt roads in the northern sector of Beale AFB, 600 feet west of Upper Blackwelder Lake. The EOD area consists of two bunkers for burning ordnance and a trench that measures approximately 70 feet long by 15 feet wide by 10 feet deep. Unused ordnance (active munitions, explosives, flares, and pyrotechnics) from military bases around Sacramento are detonated in the bunkers or in the open field.

Diesel fuel and an underlying/overlying layer of wood are used to burn the smaller ordnance. No residual fuel remains after the fire burns itself out. After burning, remains are inspected and unburned ammunition is removed. The burned portion of the ordnance, primarily metal casings, is then disposed in the trench.

During precipitation, the disposal trench fills with water. The standing water provides a hydraulic head which could help move any contaminants in the trench toward groundwater.

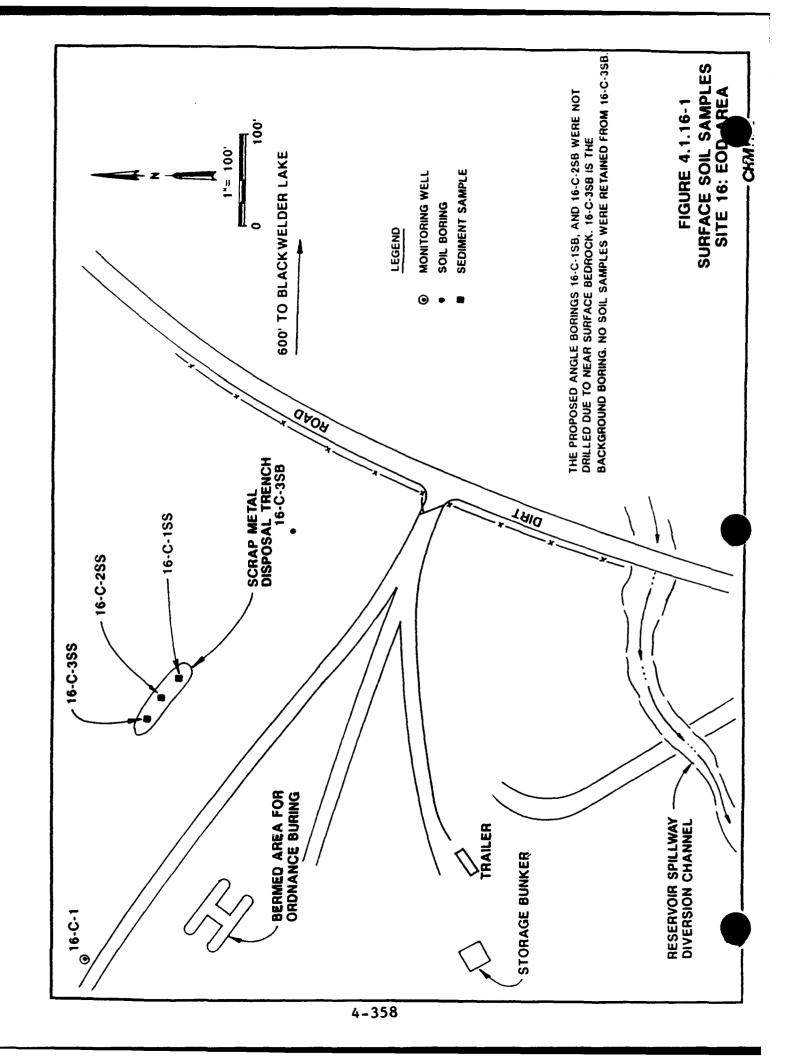
During IRP Stage 2-1 activities three surface soil samples were collected with a hand auger from the bottom of the scrap metal trench (Figure 4.1.16-1). A vertical background boring and two angled borings beneath the disposal trench were scheduled to be drilled to depths of 50 feet. Three attempts were made to drill the background boring (16-C-3SB) east (uphill) of the trench. Each attempt met refusal on bedrock at a 5- to 6-foot depth below ground surface. Field reconnaissance revealed several bedrock exposures at Site 16. Rock is exposed in the sides and bottom of the disposal trench. The scheduled angled borings were not drilled. No soil samples were collected from borings at Site 16.

One monitoring well was constructed and sampled at Site 16 during the Stage 2-1 study.

A magnetic geophysical investigation was conducted in the vicinity of the trench at Site 16 to determine whether other buried scrap metal trenches were present.

4.1.16.1 Presentation of Results

The following section presents the results of the field investigation conducted at Site 16. The discussion focuses



on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on soil and groundwater samples and the results of the geophysical examination of the area.

4.1.16.1.1 Site Geology

Evaluation of the geology and hydrogeology at Site 16 is based on one shallow borehole and on a monitoring well drilled during the current Stage 2-1 investigation. Although surface soil samples were collected during the previous Phase II, Stage 1 investigation, no drilling was accomplished at that time (AeroVironment, 1987). During the current investigation, one vertical background boring and two angled borings beneath the disposal trench were scheduled to be drilled. Three attempts were made with a hollowstem auger to drill the background boring east (uphill) of the trench. Each attempt met refusal on bedrock at a depth below ground surface of 5 to 6 feet. Field reconnaissance revealed bedrock outcrops near the top of hills northeast and south of the disposal trench. Rock is exposed in the sides and bottom of the disposal trench. Because the bedrock was so near the surface, the scheduled angled borings The locations of the borehole and moniwere not drilled. toring well are shown on Figure 4.1.16-1. Soil boring logs are provided in Appendix D.

The log of 16-C-1 shows that near-surface materials at Site 16 consisted of sandy silt and clay. In the well borehole, drilled with a casing hammer rig, sand and gravel increased with depth to about 10 feet. Clasts appeared to consist of metamorphosed mafic volcanics. At about 10 feet, the well borehole encountered a lean clay, which was likely the weathered bedrock surface. Below this point, the rock became increasingly competent, and the rate of drilling advance slowed considerably. Occasionally, thin zones of alteration were contacted along fractures where the rock was weathered to a clay-like consistency. The borehole was terminated at a total depth of 37 feet.

Surface soils at Site 16 have been mapped as belonging to the Pardee-Pardee Variant complex, a shallow, gravelly soil formed above igneous bedrock (SCS, 1985). The surface geology was also mapped as belonging to the basement complex of the Sierra Nevada, a pre-Tertiary unit comprising metamorphosed igneous and sedimentary rocks, and intrusive igneous rocks (Page, 1980). These rocks are the bedrock at Beale AFB. Outcrops of this unit are visible in the vicinity of Site 16, as described above.

4.1.16.1.2 Site Hydrogeology

Groundwater at Site 16 appears to flow in fractures in the bedrock. The first zone of alteration within the rock that produced moist cuttings occurred at a depth of 26 feet BGS (133 feet NGVD), and lasted for a few inches. Another damp alteration zone was encountered at a depth of between 35 and 36 feet BGS (123-124 feet NGVD). After the well was completed the groundwater rose to a depth of about 14 feet beneath the ground surface (145 feet NGVD), implying that the groundwater was under confining pressure in the fractures.

As Figure 4.1.16-1 shows, Upper Blackwelder Lake lies about 600 feet east of well 16-C-1. A swale with an intermittent stream lies about 500 feet west of well 16-C-1. Approximately 20 feet of relief separates these water bodies. The lake may provide recharge to groundwater in the vicinity of Site 16, while the swale may represent a discharge point. If so, then well 16-C-1 and the EOD area lie along this groundwater path between the lake and the stream. Otherwise, groundwater may move to the west along a regional gradient. More data are needed to confirm the direction of groundwater flow in the vicinity of Site 16.

Groundwater levels were measured in well 16-C-1 during the IRP Stage 2-1 investigation, and are presented in Table 4.1.16-1. A hydrograph of these levels is shown on Figure 4.1.16-2. The data show that groundwater levels varied about 3 feet during 1989. The groundwater reached its peak near the end of the rainy season, which may correspond to the time of greatest water storage in Upper Blackwelder Lake.

Table 4.1.16-1 GROUNDWATER ELEVATIONS: SITE 16 (FEET NGVD)

Well	Screened	Jan.	March	May	Aug.	Nov.
	Interval	1989	1989	1989	1989	1989
16-C-1	144-123	145.57	147.64	148.71	147.53	145.71

Because of the low yield of well 16-C-1, it was not possible to pump test this well. Instead, the well was given a slug test. Hydraulic conductivity was derived according to the Bouwer and Rice Method (1976). A discussion of aquifer



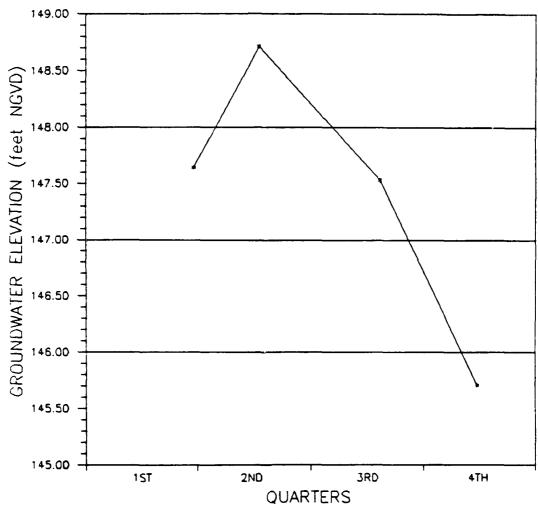


FIGURE 4.1.16-2
MONITORING WELL HYDROGRAPH
SITE 16: EOD AREA

testing methodology and a plot of the water level recovery curve are provided in Appendix E. According to this method, the hydraulic conductivity was 1.2 feet per day $(4.2 \times 10^4 \text{ cm/sec})$.

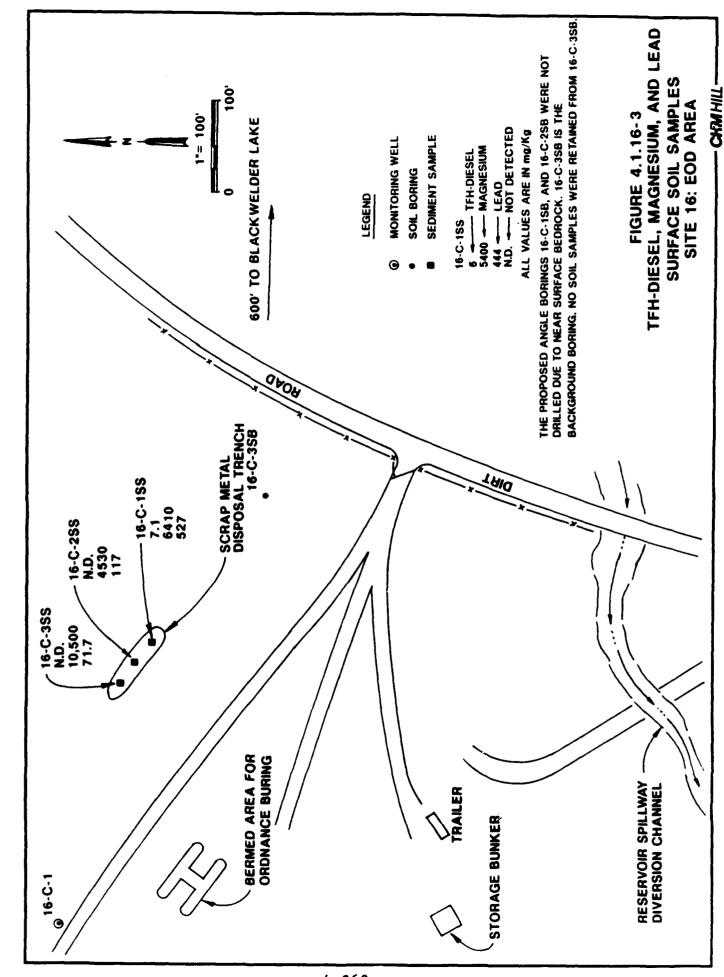
4.1.16.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.16.1.4 and in Appendix A.

Three surface sediment samples (16-C-1SS, -2SS, and -3SS) were collected in the disposal trench at Site 16 (Figure 4.1.16-3). These surface sediment samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), TFH-diesel and -gas (California method) and explosives.

In surface samples 16-C-1SS, -2SS, and -3SS, barium, cadmium, copper, chromium, iron, lead, nickel, potassium, magnesium, manganese, vanadium, and zinc were detected at levels over two standard deviations above average background levels in soil borings at Beale AFB. However, the background borings for this investigation were drilled in alluvial sediments whereas the trench at Site 16 was dug in weathered metamorphosed basalt which probably has higher amounts of iron and magnesium than the background samples. Lead was detected at 527 mg/kg in 16-C-1SS, 117 mg/kg in 16-C-2SS, and 71.7 mg/kg in 16-C-3SS. TFH-diesel was only detected in 16-C-1SS at 7.1 mg/kg (Figure 4.1.16-3). TFH-gas and explosives were not detected in surface sediment samples. Di-n-butyl phthalate (0.40 mg/kg) was detected in 16-C-1SS.

Through the four quarterly rounds of water sampling at Site 16, four groundwater samples were collected from monitoring well 16-C-1. Analyses performed for the groundwater sample were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7421), mercury (7470/7471), selenium



(7740), water quality parameters (various methods), TFH-diesel and -gas (California method), and the explosives analyses RDX, picric acid, and TNT.

No organic compounds, arsenic, lead, mercury, selenium, TFH-diesel, TFH-gas or explosives were detected in groundwater at Site 16 during the first three quarterly sampling rounds of this investigation.

In the fourth round sample at well 16-C-1 explosives were detected for the first time. TNT was tentatively identified at 0.2 ug/l (below the LOQ of 0.8 mg/l). RDX was detected at 1 ug/l. These analyses were not performed on the duplicate sample due to contractual limitations.

TFH-gas was detected at 0.080 mg/l in the original sample, at the 0.050 LOQ in the field replicate, and was not detected in the equipment wash blank. Toluene was not detected in the original sample or the field or ambient condition blanks. It was detected at 3 ug/l in the field replicate but was not detected in the second column confirmation. Methylene chloride was detected at 11 ug/l (13 ug/l in the second column) in the equipment wash blank but not in the sample, field replicate, or ambient condition blank. Trichlorofluoromethane was detected at 4 ug/l (6 ug/l in the second column) in the equipment wash blank and at 2 ug/l (1 ug/l in the second column) in the ambient condition blank but was not detected in the original sample or the field replicate.

TDS were 216, 233, 250, and 234 mg/l in successive sampling rounds. Major anions and cation concentrations at this well were generally similar to other sites at Beale AFB. Nitrite plus nitrate (expressed as nitrate) were 12.0, 13.3, 14.8, and 14.0 mg/l. Groundwater at Site 16 is a calcium-magnesium bicarbonate type.

4.1.16.1.4 Analytical Results Table

Table 4.1.16-2 presents a summary of all detected analytes for Site 16. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.16-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of Applicable or Relevant and Appropriate Requirements (ARARs) is given in Appendix I.

TABLE 4.1.16-2

BEALE AFB: SOIL DATA 1988/1989

		;		Standerds, and Action	Criteria Levels (a)	16-C-15S BAFB-0076 0.0-1.01	16-C-2SS BAFB-0077	16-C-3SS BAFB-0078 0-1-01	
Parameter	Method	Limit	Units	Federal	State				
Derrest Moieture	ASAMO	W/A	×	SE	SE	15.7	72	25.9	
TEN-Dipap	TFM-D1	1.0	mo/ka	SZ	SH	7.1	9	윺	
	50,000	20.0	o/ko	SX	SE	12000	98	15000	
	SAMOTO	10.0	ø/ko	SZ	10,000	51	438	217	
	S146010	1.0	o/ko	SZ	2	9	9	1.3	
	SUKO10	9	o/ko	S	SH	2890	2450	7080	
	S146010	3.0	0/kg	SE	200	57.4	31.8	16.2	
Cobelt	5146010	9	g/kg	S	8,000	21.4	18.4	24.3	
Const	St#6010	0 K	a/ka	SE	2,500	521	137	135	
	S46010	10.0	Ma/ka	SI	SE	37000	26100	37400	
544	SW6010	20.0	mo/ko	SE	1,000	527	117	7.17	
Macresita	010975	901	o/ko	SN	SE	6430	4530	10500	
denough the second	SW6010	1.5	mo/ko	SH	SZ	1490	208	899	
Mickel	SW6010	0.4	ma/ka	SH	2,000	51.8	14.5	13.5	
Potassium	SW6010	002	mo/kg	SH	SE	1540	113	2430	
Sodium	SW6010	2	ma/ka	SH	SZ	248	212	5 22	
	S46010	20.0	a / c	ST	20	2	⊋	113	
Appedium.	Sta6010	0.4	mo/ko	SN	2,400	95.6	87.1	121	
2 inc	SW6010	2.0	mo/ko	SE	2,000	610 4	3 242	B 233 B	
Bethylene Chloride	SW8240	0.00	mo/ka	S	SE	900.0	0.00%	300.00 F	
ormanio	SW8240	0.005	a/kg	SE	SH	0.005	9	윺	
Phenol	SW6270	0.33	mo/ko	SE	SE	2.1	8 2.4	8 1.98	
Di-n-butylphthelate	SH6270	0.33	mo/ko	SX	SE	07.0	0.32	J 0.32 J	
bis(2-ethylhexyl)phthalate	SW6270	0.33	10 /kg	SH	N	0.25	2	9	
MOTES: Results reported for detected	detected	analytes only	ıty.						0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
MT: analyte not tested			•	- : e	malyte dete	: analyte detected in blank	¥		e: equipment wash blank
				•	,	A Death and			A tinha and inches

MD: analyte not detected.

MD: analyte not detected.

MS: No standard critaria or action level currently exists.

MS: No standard critaria or action level currently exists.

MS: No standard critaria or action level b: field blank (ambient condition blank)

MS: No standard in () are 2nd column confirmation values.

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MS: No standard in () are 2nd column confirmation as 2nd section level. See Appendix I.

MINITION IN the Federal standard for Nit te + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

MD of the column of the standard for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.16-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

				Standards, Criteria and Action Levels (a)	riteria evels (a)	16-C-1GW		
	Method	Detection Limit	n Units	Federal	State	BAFB-0490 03/14/89	BAFB-0527 04/18/89	
Specific Conductivity	E120.1	1.0	um/soum	S#	906	250	TM	
Temperature	E170.1	4/ *	deg C	SN	SW	20.5	T.X	
30	£150.1	N/A	₹	6-5	WS	7.18	T.	
Alkalinity - Total	S04603	1.0	1/64	20	N	104.8	H	
Bicarbonate	SH403	1.0	7	SN	SN	127.9	Ħ	
Total Dissolved Solids	E160.1	0.5	1/04	200	200	216	H	
Chloride	E325.3	1.0	7	250	250	12.5	T.W	
Flioride	£340.2	0.050	1/0	7	1.4	0.11	H	
Mitrate + Mitrite	E353.3	0.050	\d <u>u</u>	10	45	12.0	N	
Stil fate	E375.4	1.0)/BW	250	250	12.9	Ħ	
	St46010	3.	7/2	SW	SN	26.3	¥	
	SW6010	1.00	1/02	SE	SH	12.2	Ħ	
Sodius	SW6010	9.	1/0	N	SE	11.7	Ħ	
MOTTER. Beet to property	or detected as	anal vtes	solv.					*
Moins: Acadetta lapol ted 101 detected when your conty.	***************************************				alves dete	B. analyte detected in blank	-	e: equipment wash blank

MI: analyte not tested

MI: analyte not detected.

MI: field replicate

F: field replicate

MI: field blank (ambient field replicate)

MI: field blank (ambient field replicated)

MI: field blank field replicate

MI: field replicate

M

TABLE 4.1.16-2

BEALE AFB: WATER DATA ZND ROUND SAMPLING 1989

				Stenderds, C	riteria		
				and Action Levels (a)	evels (a)	16-C-1GN	
		Detection	_	:		BAFB-0577	
Parameter	Method	Limit	Units	Federal	State	06/07/89	
Specific Conductivity	E120.1	1.0	umhos/cm	SN	8	250	
Temperature	£170.1	4/ N	ပ Gep	SN	SM	20.0	
7	E150.1	4/ N	7	2-9	SH	7.78	
Alkalinity - Total	S#403	1.0	7/2	27	SN	98.0	
Bicarbonate	S#403	1.0	<u>,</u>	SE	S¥	117.1	
Total Dissolved Solids	E160.1	3.0	7/2	200	200	233	
Chloride	E325.3	1.0	Ž	220	250	12.4	
Fluoride	E340.2	0.050	1/0	~	1.4	0.12	
Entrate + Entrite	E353.3	0.020	2	1 0	45	13.3	
Sulfate	E375.4	1.0	7	220	250	15.7	
Colcius	Su6010	.0	\ <u>`</u>	SH	SH	9:52	
Heonesium	SW6010	9.1	702	SH	SN	11.9	
Sodiu	SW6010	1.00	7/02	N.S	SN	11.4	
M-Nitrosodipheny(seine (1)	SH8270	5	1/8n	SH	SH	6 BJ	
bis(2-Ethylhexyl)Phthalate	SU8270	10	1/80	SN	SN	7 9	
		,					

MOTES: Results reported for detected analytes only.

8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

e: equipment wash blank f: field replicate R: resample

WI: analyte not tested

WI: analyte not detected.

WI: astimated values.

WI: deld blank (ambient condition blank)

WI: values listed in () are 2nd column confirmation values.

WI: values listed in () are 2nd column confirmation values.

WI: values listed in () are 2nd column confirmation values.

WI: values listed in () are 2nd column confirmation values.

WI: values listed in () are 2nd column confirmation action limits. Actual detection limits for each analysis are given in Appendix A.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.16-2

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

		•		and Action Levels (a)	evels (a)	16-C-1GV
Parameter	Method	Detection	n Units	Federal	State	BAFB-0656 09/19/89
Specific Conductivity	E120.1	1.0	umhos/cm	SE	906	250
Temperature	£170.1	Y/X	deg C	SN	NS	20.0
	£150.1	W/A	7	2-9	SN	7.86
Alkalinity - Total	SM403	1.0	7	20	SE	104.0
Bicarbonate	SPK 03	1.0	\ <u>\</u>	SZ	N	126.9
Total Dissolved Solids	£160.1	3.0	7	200	200	250
Chloride	E325.3	0.	1	220	250	13.0
Fluoride	E340.2	0.050	1/0	~	1.4	0.10
Nitrate + Mitrite	E353.3	0.050	/02	10*	45	14.8
Sulfate	E375.4	1.0	//	250	250	13.0
Calcium	SW6010	1.00	/2	SN	SM	26.5
Hegnesium	SW6010	1.00	1/0	SE	SN	12.0
Sodium	SW6010	1.00	1/01	W	KS	10.9
N-Nitrosodiphenylamine (1)		5	7/85	SN	SZ	٠,9
bis(2-Ethylhexyl)Phthalate		2	1/85	SN	S	56 B

MS: Mostandard criteria or action level currently exists.

MS: No standard criteria or action level currently exists.

(): values (isted in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

** The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NT: analyte not tested

TABLE 4.1.16-2

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

Method Limit Units Federal State 11/17/89 11/17/8			•		Standards, Criteria and Action Levels (a)	Criteria Levels (a)	16-C-1GV	16-C-1GW	16-C-164	16-C-1GW ^b	
£120.1 1.0 cmthos/cm NS 900 255 255 NT £170.1 N/A deg C NS NS 20.0 20.0 NT £150.1 N/A deg C NS NS 7.94 7.94 NT £150.1 N/A deg C NS NS 7.94 7.94 NT £150.1 N/A deg C NS NS 7.94 NT NT £150.1 N/A deg C NS NS 7.94 NT NT £160.1 3.0 mg/l 20 NS 7.94 NT NS 7.8 £160.1 3.0 Mg/l 20 50 250 13.0 ND ND £357.3 1.0 mg/l 1.0 45 14.0 10.2 ND £357.3 1.0 mg/l NS NS 16.0 ND ND £357.4 1.0 mg/l NS NS	Parameter	Method	Detection Limit	Units	Federal	State	11/17/89	8AF8-0691 11/17/89	BAFB-0692 11/17/89	BAFB-0693 11/17/89	
E170.1 N/A deg C NS NS 20.0 20.0 NT S150.1 N/A deg C NS NS 7.94 7.94 NT S150.1 N/A pH 5-9 NS 7.94 7.94 NT S150.1 N/A pH 5-9 NS 7.94 7.94 NT S150.1 NM PH 5-9 NS 7.94 7.94 NT S150.1 NM S150.2 NM S196.0 96.2 6.4 NT S150.1 NM S150.2 NM	Specific Conductivity	£120.1	1.0	umhos/cm	SX	006	255	255	-	R	
E150.1 N/A pH 5-9 NS 7.94 7.94 NI SM403 1.0 mg/l 20 NS 98.0 96.2 6.4 SM403 1.0 mg/l 20 NS 19.6 19.8 7.8 E340.1 3.0 mg/l 500 500 234 216 13.0 E325.3 1.0 mg/l 250 250 124 0.14 ND E340.2 0.050 mg/l 250 250 11.4 0.14 ND E375.4 1.0 mg/l 10* 45 14.0 10.2 ND E375.4 1.0 mg/l 10* 45 14.0 10.2 ND F175.4 1.0 mg/l 10* 45 14.0 10.2 ND F175.4 1.0 1.0 10* 45 14.0 10.2 ND SM6010 1.00 mg/l NS NS 11.2 </td <td>Temperature</td> <td>E170.1</td> <td>K/M</td> <td>deg C</td> <td>SN</td> <td>SN</td> <td>20.0</td> <td>20.0</td> <td>H</td> <td>Ħ</td> <td></td>	Temperature	E170.1	K/M	deg C	SN	SN	20.0	20.0	H	Ħ	
\$M403 1.0 mg/l 20 NS 98.0 98.2 6.4 \$M403 1.0 mg/l NS NS 119.6 119.8 7.8 \$M403 1.0 mg/l \$50 \$50 234 216 13.0 \$E355.3 1.0 mg/l \$50 \$50 13.0 12.4 ND \$E355.3 0.050 mg/l 250 250 13.0 12.4 ND \$E355.4 0.050 mg/l 10** 45 14.0 10.2 ND \$M5010 1.0 mg/l NS NS 0.080 0.050 ND \$M5010 1.00 mg/l NS NS 11.5 12.0 ND \$M5010 1.00 mg/l NS NS 10.2 ND 4(6) \$M5010 1.00 mg/l NS NS 10.2 ND 4(6) \$M5010 1.00 mg/l NS NS	· **	£150.1	4/	ŧ	2-9	SH	7.94	7.%	K	×	
SM403 1.0 mg/l NS NS 119.6 119.8 7.8 E160.1 3.0 mg/l 500 500 234 216 13.0 E325.3 1.0 mg/l 250 250 13.0 10.4 NO E355.3 1.0 mg/l 250 250 13.0 10.4 NO E353.3 0.050 mg/l 10* 4.5 14.0 10.2 NO E375.4 1.0 mg/l 10* 4.5 14.0 10.2 NO E375.4 1.0 mg/l NS NS 14.0 10.2 ND SM6010 1.00 mg/l NS NS 11.5 12.0 ND SM6010 1.00 mg/l NS NS 11.5 ND MD SM6010 1.00 mg/l NS NS 10.2 ND 4(6) SM6010 1.00 mg/l NS NS	Alkalinity - Total	S#403	1.0	<u> </u>	20	N	98.0	98.2	4.9	L#	
E160.1 3.0 mg/l 500 534 216 13.0 E325.3 1.0 mg/l 250 250 13.4 ND E340.2 0.050 mg/l 10° 45 14.0 10.4 ND E353.3 0.050 mg/l 10° 45 14.0 10.2 ND E375.4 1.0 mg/l NS 250 250 11.1 12.0 ND FFH-D1 0.050 mg/l NS NS 26.7 27.6 ND SM6010 1.00 mg/l NS NS 12.0 ND SM6010 1.00 mg/l NS NS 12.0 ND SM6010 1.00 mg/l NS NS 10.2 ND 4(6) SM6010 1.00 mg/l NS NS 10.2 ND 4(6) SM6010 1.00 mg/l NS NS 10.3 ND 4(6)	Bicarbonate	SM403	1.0	7	SN	SN	119.6	119.8	7.8	E	
E325.3 1.0 mg/l 250 250 13.0 12.4 ND E340.2 0.050 mg/l 25 1.4 0.12 0.14 ND E353.3 0.050 mg/l 10* 45 14.0 10.2 ND E375.4 1.0 mg/l 250 250 11.1 12.0 ND TFH-D1 0.050 mg/l NS NS 0.080 0.050 ND SN6010 1.00 mg/l NS NS 11.5 12.0 ND SN6010 1.00 mg/l NS NS 11.2 NO ND SN6010 1.00 mg/l NS NS 11.12 NO ND SN6010 1.00 mg/l NS NS 10.2 10.3 ND SN6010 1.00 Ng/l NS NS 6 J NJ 16.1 SN6010 0.01 ng/l NS NS 6 J ND 15 USGS01 0.01 ng/l NS	Total Dissolved Solids	E160.1	3.0	1 / 2	200	200	234	216	13.0	LN L	
E340.2 0.050 mg/l 2 1.4 0.12 0.14 ND E353.3 0.050 mg/l 10** 45 14.0 10.2 ND E375.4 1.0 mg/l 10** 45 14.0 10.2 ND FFH-D1 0.050 mg/l NS NS 0.080 0.050 ND SM6010 1.00 mg/l NS NS 12.0 ND SM6010 1.00 mg/l NS 11.2 ND ND SM6010 1.00 mg/l NS 11.2 ND ND SM6010 1.00 mg/l NS NS 10.2 10.3 ND SM6010 1.00 mg/l NS NS 10.2 10.3 ND SM6010 1.00 mg/l NS 3,400 ND 4(6) SM6010 1 ug/l 14,300 100 10.3 ND 4(6) <	Chloride	E325.3	1.0	7	250	250	13.0	12.4	9	H	
E373.3 0.050 mg/t 10* 45 14.0 10.2 MD E375.4 1.0 mg/t 250 250 11.1 12.0 MD TFH-D1 0.050 mg/t NS NS 0.080 0.050 ND SW6010 1.00 mg/t NS NS 11.5 12.0 ND SW6010 1.00 mg/t NS NS 11.15 NO ND SW6010 1.00 mg/t NS NS 11.12 NO ND SW6010 1.00 mg/t NS NS 11.12 NO ND SW6010 1.00 mg/t NS NS 11.12 NO ND SW6010 1.00 mg/t NS NS 10.2 10.3 MD SW6010 1.00 mg/t NS NS 10.2 10.3 MD SW6010 1.00 mg/t NS NS 10.2 10.3 MD SW6010 1.00 Mg/t NS NS 6 J ND 15 SW6010 1.00 mg/t NS NS 6 J ND 15 USGS01 0.01 mg/t NS NS 0.2 J NT NT USGS01 0.01 mg/t NS NS 0.2 J NT NT	Fluoride	E340.2	0.050	7	~	1.4	0.12	0.14	2	T	
E375.4 1.0 mg/l 250 250 11.1 12.0 ND TFH-D1 0.050 mg/l NS NS 0.050 ND SM6010 1.00 mg/l NS NS 11.5 27.6 ND SM6010 1.00 mg/l NS NS 11.5 12.0 ND SM6010 1.00 mg/l NS NS 11.2 ND ND SM6010 1.00 mg/l NS NS 10.3 ND A(6) SM6010 1.00 mg/l NS NS ND A(6) ND SM6010 1.00 MS NS NS ND A(6) ND ND A(6) SM8020 1.0 Ug/l NS NS 6.1 ND ND A(6) SM8270 1.0 Ug/l NS NS 0.2 NT NI USGS01 0.01 Ug/l NS	Mitrate + Mitrite	E353.3	0.020	7	•	45	14.0	10.2	욮	H	
TFH-D1 0.050 mg/l NS NS 0.080 0.050 ND Sub010 1.00 mg/l NS NS 26.7 27.6 ND Sub010 1.00 mg/l NS NS 11.5 12.0 ND Sub010 1.00 mg/l NS NS 1.12 ND ND Sub010 1.00 mg/l NS NS 1.12 ND ND Sub010 1.00 mg/l NS NS NS 10.3 ND Sub010 1.00 MS NS NS ND 4(6) Sub020 1 ug/l NS NS NS A Sub020 1 ug/l NS NS A A A Sub020 1 ug/l NS NS 6 ND A A Sub020 1 ug/l NS NS A A A B	Sul fate	£375.4	0.	1/02	250	250	1.1	12.0	9	=	
Subo10 1.00 mg/l NS NS 26.7 27.6 ND Subo10 1.00 mg/l NS NS 11.5 12.0 ND Subo10 1.00 mg/l NS NS 1.12 ND ND Subo10 1.00 mg/l NS NS 1.12 ND ND Subo10 1.00 mg/l NS NS 1.12 ND ND Sub010 1.00 mg/l NS 3,400 ND ND 4(6) Sub020 1.0 1.0 NS 3,400 ND 3(0) ND Sub020 1.0 ug/l 1.4,300 NS 6.3 7.3 6.3 Sub020 1.0 ug/l NS NS 6.3 ND 15 Sub020 1.0 1.0 1.0 1.0 NS NS 0.2 N Sub020 1.0 1.0 1.0 1.0	TFN-Diesel	TFH-DI	0.020	7/02	SN	SN	0.080	0.050	₽	Ħ	
SN6010 1.00 mg/l NS NS 11.5 12.0 ND SN6010 1.00 mg/l NS NS 1.12 ND ND SN6010 1.00 mg/l NS NS 10.2 10.3 ND SN6010 1.00 mg/l NS 3,400 ND 11(13) SN8020 1 ug/l 14,300 100 ND 3(0) ND SNB270 10 ug/l NS NS 6 J 7 6 SNB270 10 ug/l NS NS 0.2 NT NT USGS01 0.01 ug/l NS NS 0.2 NT NT NGS01 0.01 ug/l NS NS N NT NT	Calcium	SW6010	9:	7/02	SN	SH	26.7	27.6	2	Ħ	
Subscite 1.00 mg/l NS NS 1.12 ND ND Subscite 1.00 mg/l NS NS 10.2 10.3 ND Subscite 1.00 mg/l NS 3,400 ND 11(13) Subscite 1 ug/l 14,300 100 ND 3(0) ND Subscite 10 ug/l NS NS 6.1 7.1 6.1 Subscite 10 ug/l NS NS 0.2 NT NT USGS01 0.01 ug/l NS NS 0.2 NT NT	Magnesium	Su6010	9.1	7	SN	ST	11.5	12.0	2	Ħ	
SM6010 1.00 mg/l NS NS 10.2 10.3 MD SM6010 5 ug/l NS NS ND 11(13) SM6010 1 ug/l NS 3,400 ND 11(13) SM6020 1 ug/l 14,300 100 ND 3(0) ND SM6270 10 ug/l NS 6.1 ND 15 USGS01 0.01 ug/l NS NS 0.2.1 NT NT USGS01 0.01 ug/l NS NS 1 NT NT	Potassium	SW6010	8.	7	SN	ST	1.12	2	2	Ŧ	
SUBD10 5 Ug/L NS NS ND ND 11(13) SUBD10 1 Ug/L NS 3,400 ND 4(6) SUBD20 1 Ug/L 14,300 100 ND 3(0) ND SUBD270 10 Ug/L NS NS 6,3 ND 15 USGS01 0.01 Ug/L NS NS N NT NT USGS01 0.01 Ug/L NS NS 1 NT NT	Sodium	Su6010	.8	7/02	SE	SH	10.2	10.3	⊋	H	
SUBD10 1 ug/L NS 3,400 ND ND 4(6) SUBD20 1 ug/L 14,300 100 ND 3(0) ND SUBD20 10 ug/L NS NS 6,3 ND 15 SUBD270 10 ug/L NS NS 6,3 ND 15 USGS01 0.01 ug/L NS NS N NT NT USGS01 0.01 ug/L NS NS 1 NT NT	Methylene chloride	Su 3 010	'n	1/85	SE	SH	웆	⊋	11(13)		
SUBD20 1 Ug/L 14,300 100 ND 3(0) ND SUB270 10 Ug/L NS NS 6 J 7 J 6 J SUB270 10 Ug/L NS NS 6 J ND 15 USGS01 0.01 Ug/L NS NS 0.2 J NT NT USGS01 0.01 Ug/L NS NS 1 NT NT	Trichlorofluoromethane	Su8010	-	7/05	SE	3,400	€	Ş	(9)7	-	
SUB270 10 Ug/1 NS NS 6.3 7.3 SUB270 10 Ug/1 NS NS 6.3 ND USGS01 0.01 Ug/1 NS NS 0.2 J NT USGS01 0.01 Ug/1 NS NS 1 NT	Toluene	SUB020	-	1/85	14,300	5	욮	3(0)	2		
SMB270 10 ug/t NS NS 6.J ND USGS01 0.01 ug/t NS NS 0.2.J NT USGS01 0.01 ug/t NS NS 1 NT	M-Witrosodiphemylamine (1)	SW8270	5	1/85	SE	SE	•		9	LN T	
USGS01 0.01 Ug/t NS NS 0.2 J NT USGS01 0.01 Ug/t NS NS 1 MT	bis(2-Ethylhexyl)Phthalate	SUB270	2	1/60	SN	SH	ý	2	15	¥	
USGS01 0.01 ug/l NS NS 1 NT	TMT	USGS01	0.01	7/65	SN	SH	0.2	N N	H	Ħ	
	ROX	USGS01	0.01	1/8 5	S N	SE	-	H	H	H	

MOTES: Results reported for detected analytes only.

MI: analyte not tested

MI: analyte not tested

MI: analyte not detected.

MI: analyte not detected in () are sample

MI: analyte not detected.

MI: analyte not detected in () are sample

MI: analyte not detected in blank

MI: analyte not detected.

MI: analyte not detected in blank

MI: field replicate

MI: field r

4.1.16.1.5 Discussion of Analytical Data

Contaminants detected at Site 16 included metals (barium, cadmium, chromium, copper, lead, nickel, potassium, magnesium, and zinc) in the soil samples above the background range for soils at Beale. TFH-diesel was also detected in one soil sample. Soil borings originally planned for Site 16 could not be drilled because of bedrock present in the area. Table 4.1.16-3 presents the range of contaminants encountered for each of the media sampled (surface soil and groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the limit of quantification. These detections may represent laboratory "noise" and some of the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study, the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.16.2 Sampling and Analytical Problems

4.1.16.2.1 Loss of Samples

There were no sample loss problems for Site 16 samples. The first quarter groundwater sample was resampled for analysis of explosives due to missed holding times. All scheduled analyses were completed for Site 16 except for RDX in the explosives analyses in the third groundwater sampling round. The RDX equipment calibration standard was not available from the U.S. Army in September 1989.

Table 4.1.16-3
RANGES OF CONTAMINANTS DETECTED AT SITE 16

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
SURFACE SOILS				
TFH-diesel	mg/kg	ND	7.1	1/3
barium		179	438	3/3
cadmium		ND	1.3	1/3
chromium	mg/kg	16.2	57.4	3/3
copper	mg/kg	125	137	3/3
l ead	mg/kg	71.7	527	3/3
magnesium	mg/kg	4530	10,500	3/3
nickel	mg/kg	13.5	51.8	3/3
potassium	mg/kg	1170	2430	3/3
thallium	mg/kg	ND	113	1/3
zinc	mg/kg	233B	6108	3/3
di-n-butyl phthalate	mg/kg	(0.32)	0.40	3/3
GROUNDWATER				
TFH-diesel	mg/kg	ND	0.080	1/4
TNT	ug/l	ND	1	1/3
RDX	ug/l	ND	0.2 J	1/3

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (8), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

4.1.16.2.2 Likelihood that Positive Samples were Contaminated in the Field or Laboratory

Surface soil samples collected at Site 16 contained several organic compounds which were probably laboratory or field induced false positive results. All of the soil samples collected contained methylene chloride. This is a common laboratory contaminant.

All of the soil samples contained the semivolatile compound di-n-butyl phthalate, and one contained bis(2-ethylhexyl) phthalate. The phthalate compounds were commonly detected in samples from throughout the base, at similar concentrations, and are probably false positive results.

Phenol was detected in all of the soil samples at concentrations of 1.9-2.4 mg/kg. This has been traced to a factory contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Toluene was tentatively identified below the LOQ in one of the soil samples. Toluene was detected in samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent and low concentration suggests that it is a false positive result.

Zinc was detected in the soils method blank, but at a much lower concentration than in the samples. Although zinc has a "B" qualifier, it should not be considered a false positive result.

No soil replicate QC samples were collected at Site 16.

N-nitrosodiphenylamine was detected below the LOQ in both the sample and the associated method blank in the second round groundwater sample. In the third round, bis(2-ethylhexyl)phthalate was detected at 26 ug/l but was also detected in the method blank.

4.1.16.2.3 Analytical Results Obtained under Out-of-Control Conditions

In the 8270 semivolatile organics analysis of the fourth quarter sample at well 16-C-1, the surrogate spike recovery of 41 percent for 2-Fluorobiphenyl was below the acceptable range of 43 to 116 percent. The equipment wash blank for this sample had three surrogate spike recoveries below acceptable limits: Nitrobenzene-d5 was 31 percent (below

the 35 to 114 percent range), 2-Fluorobiphenyl was 35 percent (below the 43 to 116 percent range), and 2-Fluorophenol was 13 percent (below the 21 to 100 percent range).

4.1.16.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.16.3 Significance of Findings

Soil

Three surface soil samples were collected with a hand auger from the bottom of the disposal trench. TFH-diesel was detected in one of the three samples at 7.1 mg/kg. The TFH-diesel LUFT cleanup standard calculated for this sample is 100 mg/kg.

ICP metal concentrations for barium, cadmium, chromium, copper, potassium, magnesium, nickel, lead, and zinc were more than two standard deviations higher than at average background concentrations, but below DHS TTLC levels. The 527 mg/kg lead concentration in 16-C-1SS was one of the highest detected basewide. The DHS TTLCs for barium, cadmium, chromium (VI), chromium (III), copper, nickel, lead, and zinc are 10,000, 100, 500, 2,500, 2,500, 2,000, 1,000, and 5,000 mg/kg, respectively. DHS TTLCs are not available for the other metals. Based on the DHS TTLC criteria, the soil sampled at Site 16 is not a hazardous material.

Groundwater

One monitoring well was constructed at Site 16 during Stage 2-1. The samples collected from 16-C-1 had water quality parameters similar to groundwater samples from other wells on base. Lead was not detected in the groundwater. ICP metals detected were calcium, magnesium, and sodium, all at concentrations below 27 mg/l. These metals generally occur in groundwater, and were detected at similar levels in other groundwater samples on base.

In the fourth round sample at well 16-C-1, explosives were detected for the first time. TNT was tentatively identified at 0.2 ug/l (below the LOQ of 0.8 mg/l). RDX was detected at 1 ug/l) TFH-gas was detected at 0.080 mg/l in the original sample, at the 0.050 LOQ in the field replicate, and

was not detected in the equipment wash blank. These results represent the first indication of possible environmental contamination in groundwater at Site 16.

Geophysics

A geophysical magnetic survey was conducted in the vicinity of the trench at Site 16 to determine whether other trenches may exist. Figure 4.1.16-4 shows the interpreted extent of buried metal. This figure indicates one strong anomaly parallel with the existing trench on the east side. This may be an extension of the existing scrap metal trench which has been backfilled.

4.1.16.3.1 Zones of Contamination

The only contaminated zone found at Site 16 is the bottom of the disposal trench. The only organic contaminant detected was TFH-diesel at a relatively low concentration of 7.1 mg/kg. Thirteen ICP metals were detected at concentrations above those averaged from background soil borings at Sites 2, 3, 6, 13, 15, and 19. All metal concentrations were below the respective DHS TTLC. Based on soil sampling during IRP studies the depth of soil with TFH-diesel contamination or higher than base average metal concentrations cannot be determined.

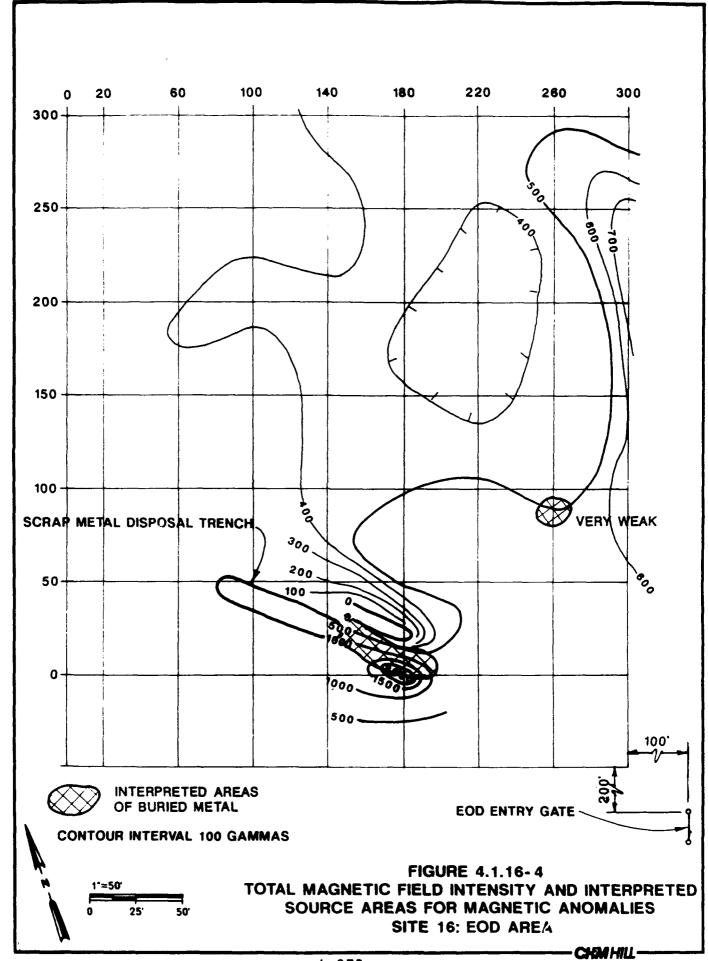
The groundwater southwest of the disposal trench at Site 16 may be affected by TNT, RDX, and TFH-gas based on the fourth quarter sample results. However, additional well installation and sampling will be needed to determine flow direction and confirm fourth-quarter sampling results.

4.1.16.3.2 Contaminant Migration

Soil contamination has only been detected in the scrap metal disposal trench. Surface water does not flow out of the trench during rain, so migration will not occur in surface water. Water ponded in the trench will either evaporate or infiltrate. Infiltrating water has the potential to transport the fuel hydrocarbons, explosives, or metals to the groundwater.

4.1.16.3.2.1 Potential to Move Off Site and Off Base

The potential for contaminant migration from Site 16 is unknown. Groundwater sampled at Site 16 contained indications of contamination in the fourth sampling round.



4.1.16.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Groundwater flow direction, gradient and velocity are unknown at Site 16. Contaminants were detected in well 16-C-1 only in the fourth sampling round.

4.1.16.3.2.3 Time of Travel to Receptors

The only human receptors at Site 16 are EOD personnel, while working in the area.

4.1.16.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 16 at this time because the groundwater gradient is not known and groundwater travels primarily by fracture flow in bedrock.

4.1.16.3.2.5 Expected Spatial and Temporal Variations in Concentration

No groundwater contaminants were detected in the first three sampling rounds but TNT, RDX, and TFH-diesel were detected in the fourth sampling round.

4.1.16.3.3 Baseline Risk Assessment

No risk assessment activities were performed as part of Stage 2-1.

4.1.17 DISCUSSION OF RESULTS FOR SITE 17: BEST SLOUGH

Best Slough is an offshoot of Dry Creek, which flows to the south and crosses Gavin Mandry Road west of the officer housing area, Figure 4.1.17-1. The site was added to the IRP investigation because old empty drums were discovered in a 50- to 100-foot trench approximately 50 feet north of the slough in January 1985.

The area investigated is north of the slough. The site has no buildings, roads, or apparent current use. Four trenches were observed in the field and are shown in Figure 4.1.17-1. Trenches 1 and 3 (trench numbers specific to this investigation) contain approximately 15 empty 55-gallon drums. The drums are severely rusted and show evidence of being punctured. No information is available on what, if anything, the drums contained. No staining of surface soils was observed. Trench 4 (Figure 4.1.17-2) is a long depression, similar in depth to the other trenches. There is also an irregular depression approximately 50 feet south of trench 4, which may be either an excavated or a natural feature.

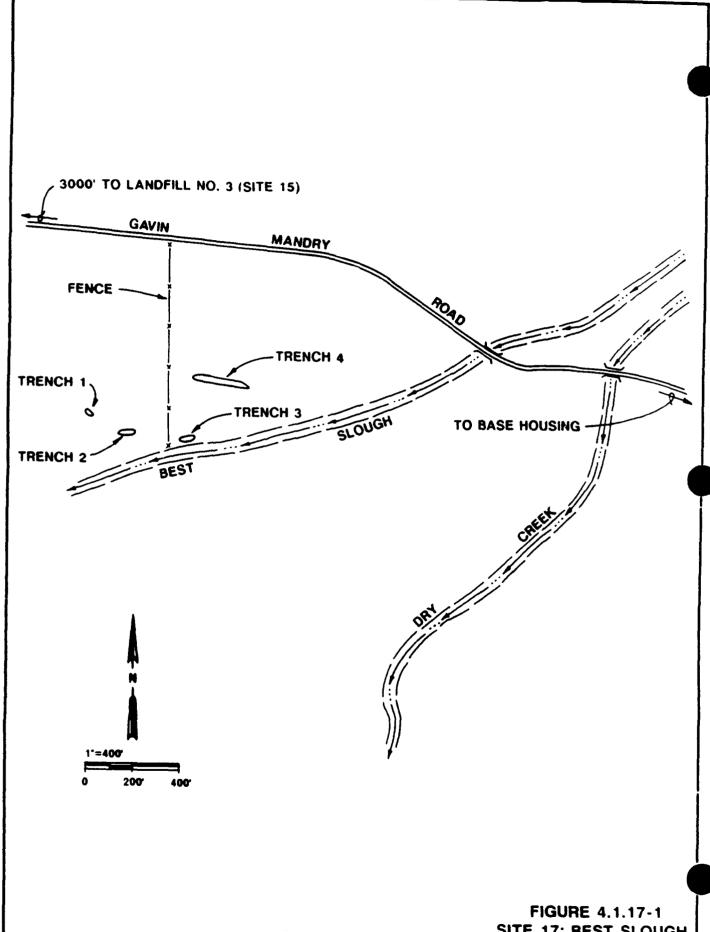
During Phase II, Stage 1, two hand auger soil samples were collected from the bottom of trenches 2, 3, and 4. Four 15-foot deep borings were drilled around trench 2. All soil samples were analyzed for oil and grease, phenols, purgeable halocarbons, and purgeable aromatics. No analytes were detected in any soil samples.

4.1.17.1 Presentation of Results

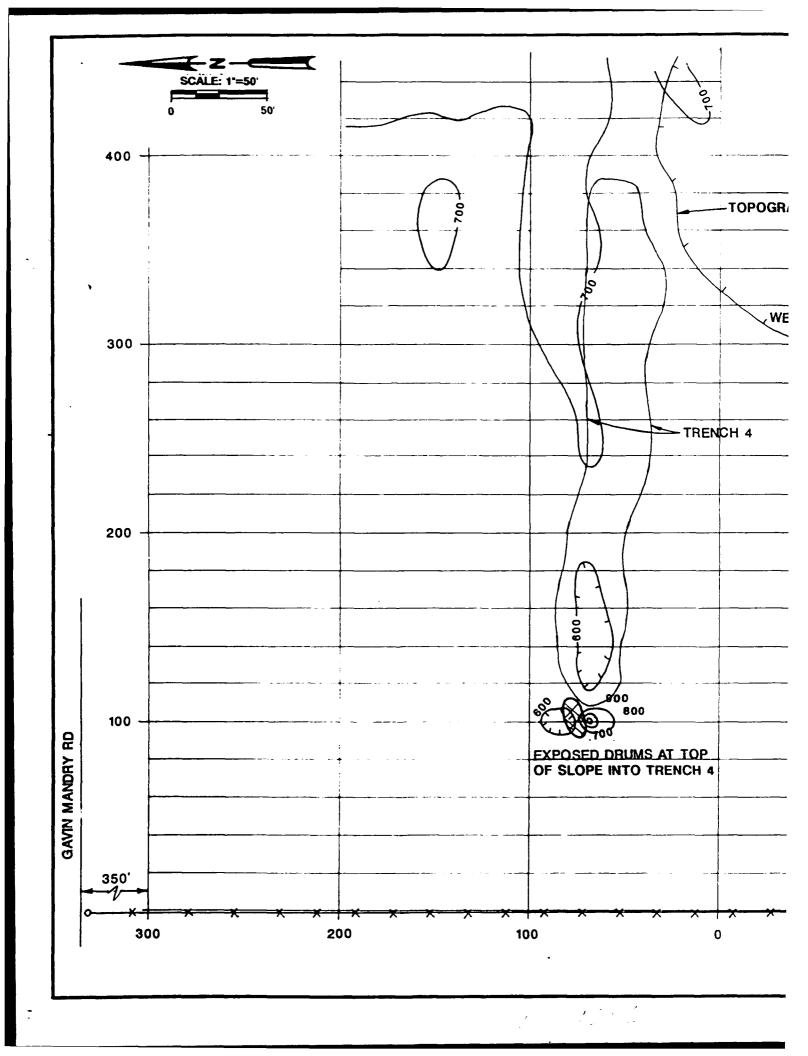
The results for Best Slough are presented in this section. Two days of geophysical surveying were conducted in the vicinity of trenches 1, 2, 3, and 4. The purpose of this investigation was to determine if geophysical evidence of buried drums was present. Because the only work done at this site was the geophysical investigation, presentation of results does not include discussion of site geology or hydrology.

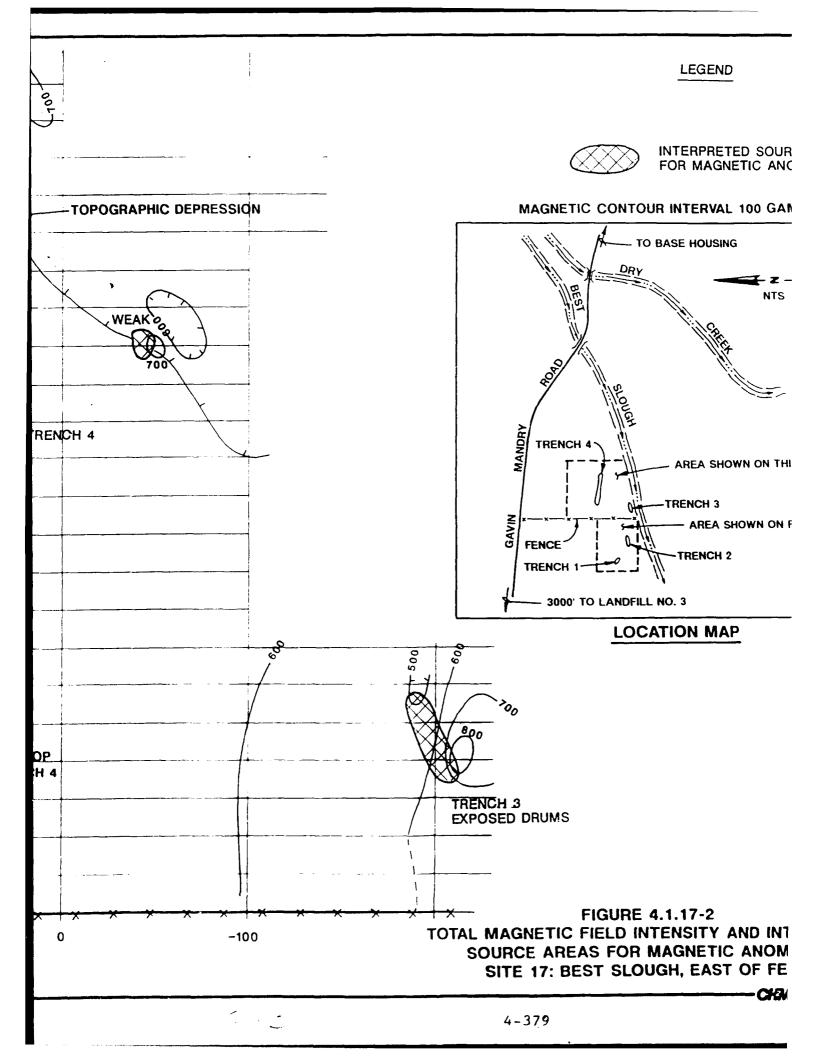
4.1.17.1.1 Site Geology--Geophysics

A geophysical investigation was conducted at Best Slough to determine if drums other than those exposed in trenches 1, 2, 3, and 4 may be buried in the vicinity. The work was done during a 2-day period; the area surveyed is shown inset in Figure 4.1.17-2. A fence which runs approximately north-south through the field was the primary reference feature.



SITE 17: BEST SLOUGH



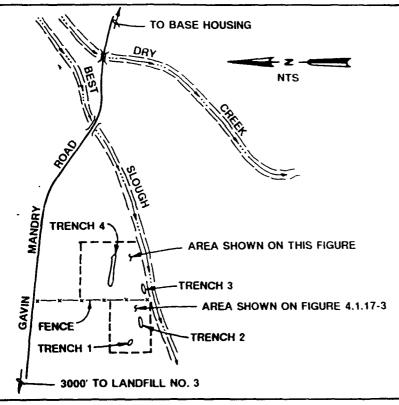


LEGEND



INTERPRETED SOURCE AREAS FOR MAGNETIC ANOMALIES

MAGNETIC CONTOUR INTERVAL 100 GAMMAS



LOCATION MAP

ENCH 3 POSED DRUMS

FIGURE 4.1.17-2

L MAGNETIC FIELD INTENSITY AND INTERPRETED

SOURCE AREAS FOR MAGNETIC ANOMALIES

SITE 17: BEST SLOUGH, EAST OF FENCE

-CHEMHILL-

Figures 4.1.17-2 and 4.1.17-3 show total field magnetic intensity and the areas interpreted as sources of magnetic anomalies at Site 17. The strongest positive anomalies were always associated with the areas where drums were exposed.

A weak magnetic low is located in the west end of trench 4. This low does not indicate metal and is most likely due to the absence (the inscribed volume of the trench) of the very weakly magnetic soils. This absence creates a "depression" or low in the naturally occurring magnetic field. Other observed anomalies were weak and were not interpreted to indicate the presence of buried drums. A plot of the total magnetic field intensity along each grid line is provided in Appendix H.

4.1.17.1.2 Site Hydrogeology

Because groundwater-related work was not performed on or near Site 17 in either IRP stage, no discussion of Site 17 hydrogeology is provided.

4.1.17.1.3 Analytical Results

No samples were collected for analysis during this site investigation.

4.1.17.1.4 Analytical Results Table

No samples were collected for analysis during this site investigation.

4.1.17.1.5 Discussion of Analytical Data

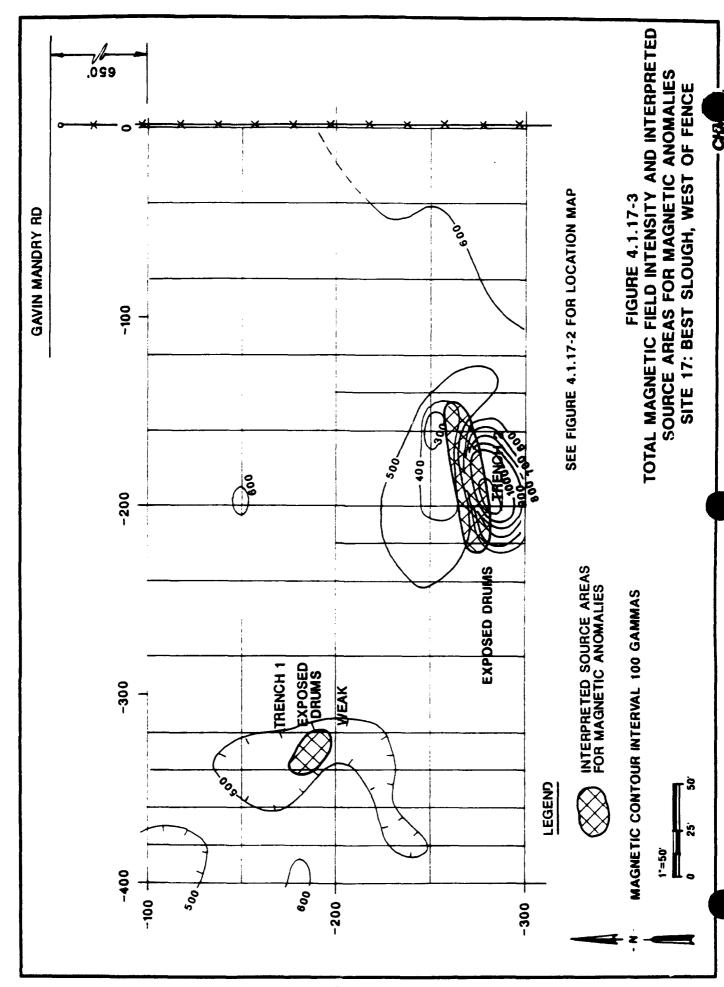
No samples were collected for analysis during this site investigation.

4.1.17.2 Sampling or Analytical Problems

No samples were collected for analysis during this site investigation.

4.1.17.3 Significance of Findings

No contaminants were detected in soil samples in the initial IRP Phase II, Stage 1 study (AeroVironment, 1987). No ground surface staining, odors, or other signs of chemical



contamination were observed near the empty drums during Stage 2-1 field work.

Based on the magnetic geophysical data collected during the Stage 2-1 study, buried drums are not believed to be present at Site 17. Magnetic field intensities characteristic of buried metal were only detected in areas adjacent to exposed drums.

4.1.17.3.1 Zones of Contamination

No contamination was detected or interpreted to exist at Site 17. Based on IRP information collected to date, including soil and surface water sampling and magnetic geophysical surveying, no zones of contamination are evident at Site 17.

4.1.17.3.2 Contaminant Migration

No contaminant migration is expected from Site 17.

4.1.17.3.2.1 Potential to Move Off Site and Off Base

No contaminants have been identified at Site 17.

4.1.17.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

This section does not apply to Site 17.

4.1.17.3.2.3 Time of Travel to Receptors

This section does not apply to Site 17.

4.1.17.3.2.17 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 17 because no contaminants were detected.

4.1.17.3.2.5 Expected Spatial and Temporal Variations in Concentration

No spatial or temporal variations in concentrations are expected at Site 17.

4.1.17.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.18 DISCUSSION OF RESULTS FOR SITE 18: BULK FUEL STORAGE FACILITY

The bulk fuel storage facility, consisting of two areas of diked, aboveground storage tanks, is on the northeast side of the intersection of Gavin Mandry Road (6th Street) and J Streets. The facility has operated since 1958. Fuels are delivered to and from the aboveground tanks by train, truck, or pipeline. Fuels include jet fuels (AVGAS) JP-4, JP-7, and JPTS, and motor gasoline (MOGAS), diesel fuel, unleaded gasoline, and No. 2 fuel oil. No major spills have been reported, but the site was evaluated because a number of minor spills have occurred while unloading rail cars.

In the Phase II, Stage 1 study, four soil borings were sampled and analyzed. The resulting report recommended no further IRP activities (AeroVironment, 1987), but regulatory agencies suggested installing monitoring wells, groundwater and soil sampling and analysis, and pipeline testing (DHS, 1987a; RWQCB, 1987a). The pipeline testing was not included in the IRP work.

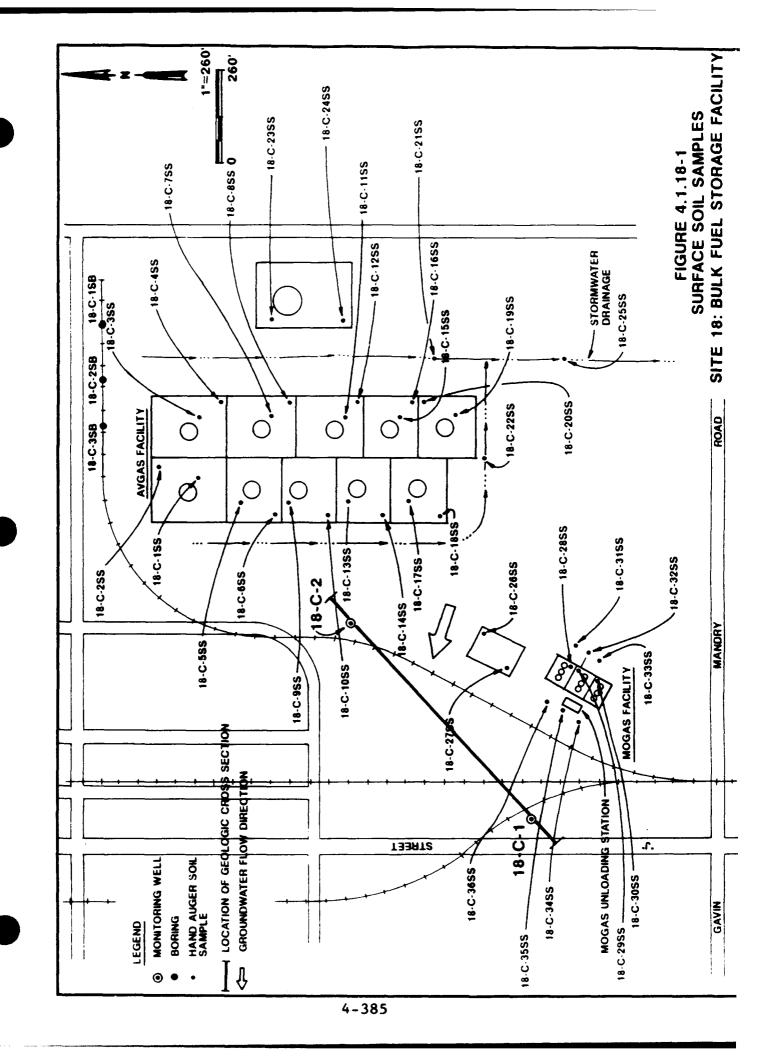
In the Stage 2-1 study, surface samples, soil borings, and monitoring wells were sampled at locations shown in Figure 4.1.18-1. Surface samples were collected in the AVGAS area from two locations within each tank berm area and from three locations along the drainage ditch. Surface samples were collected in the MOGAS area from one location in each bermed tank area, and three samples from the area where berm drainage is discharged east of the MOGAS tanks. Borings were drilled and sampled at three locations along the railroad tracks on the north side of the site, near the AVGAS unloading area. Two monitoring wells were constructed; one near the AVGAS and one near the MOGAS areas. These wells were sampled semiannually during the IRP Stage 2-1.

4.1.18.1 Presentation of Results

The following section presents the results of the field investigation at Site 18. The discussion focuses on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on samples of soil and groundwater.

4.1.18.1.1 Site Geology

Evaluation of local geology at Site 18 is based on drilling activities completed during the Stage 2-1 study. Two monitoring wells at Site 18 were drilled during Stage 2-1.



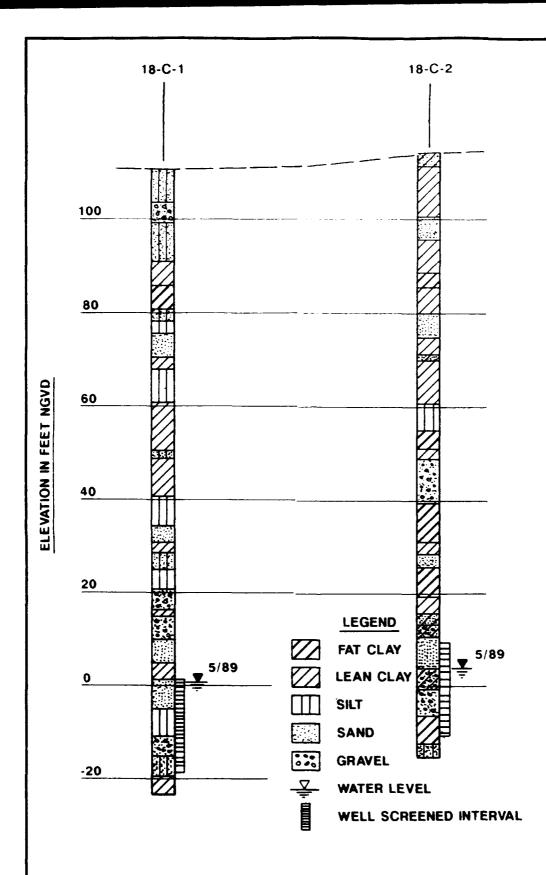
One of these wells is located west of the AVGAS facility, and one is located west of the MOGAS facility (see Figure 4.1.18-1). Both are screened across the water table. In addition, three vertical boreholes were drilled and logged along the railroad track north of the AVGAS facility. These holes ranged in depth from 11.5 to 13 feet. The location of all wells and boreholes is shown on Figure 4.1.18-1. Soil boring logs are provided in Appendix D.

A geologic cross-section drawn through soils encountered in the monitoring well boreholes is located in Figure 4.1.18-1 and shown in Figure 4.1.18-2. The investigation confirmed that subsurface soils are composed of highly variable alluvial sediments, typical of valley sediments deposited at the base of the Sierra Nevada foothills. As with many of the near-surface alluvial deposits in the Central Valley, individual beds in the vadose zone at Site 18 may generally not be correlated between drilling locations. Some correlation may be made among boreholes 18-C-1SB, 18-C-2SB and 18-C-3SB however, which were drilled close together. These holes each contacted a sandy lean clay beneath gravelly railroad ballast. Below the sandy clay, the holes encountered silts and clays to their total depths. Wells 18-C-1 and 18-C-2 were drilled through both coarse-grained stream channel deposits and fine-grained overbank deposits through their total depths. Permeable sands and gravels appear to predominate below a depth of about 90 feet BGS (about 20 feet NGVD).

Surface soils at Site 18 have been mapped as belonging to the San Joaquin Loam. This is a medium-textured soil formed on moderately old alluvial fans (SCS, 1985). The surface geology was mapped as Laguna Formation by Page (1980), a fine-to-coarse-grained continental alluvial sequence which contains cemented layers. The soil boring logs describe layers of cemented sediments in both holes. Based on color descriptions, neither hole contacted the volcanic sediments that lie under the Laguna Formation in the stratigraphic section at Beale AFB.

4.1.18.1.2 Site Hydrogeology

Near-surface groundwater in wells 18-C-1 and 18-C-2 appears to flow under generally unconfined conditions, which may be partially confined in the vicinity of each well. Well 18-C-1 produces water mainly from gravels and sandy silts overlain by a layer of moderately cemented sand. The bottom of



SCALE: 1"=260' HORIZ 1"= 20' VERT

SEE FIGURE 4.1.18-1 FOR WELL LOCATIONS

FIGURE 4.1.18-2
GEOLOGIC CROSS SECTION
SITE 18: BULK FUEL STORAGE FACILITY

the well terminates in a lean clay at a depth of 134 feet BGS (-23 feet NGVD).

Well 18-C-2 produces water from sands and gravels that extend from a depth of 103-121 feet BGS (11 to -7 feet NGVD). The bottom of the screen lies in fat clay that extends from 121-127 feet BGS (-7 to -13 feet). The clay therefore acts as a base for the uppermost saturated permeable zone in the immediate vicinity of well 18-C-2.

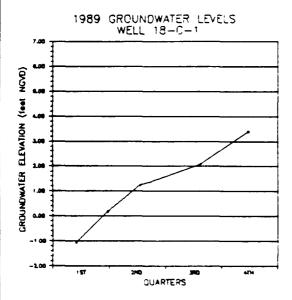
Groundwater level data from the monitoring wells at Site 18 collected during 1989 are presented in Table 4.1.18-1 and Figure 4.1.18-3. Groundwater levels in the two wells rose through all four quarters, for a total of 4.45 feet in well 18-C-1 and 3.18 feet in well 18-C-2. This continuous rise was observed in many other monitoring wells at Beale AFB that were constructed in unconsolidated sediments and may be part of a regional long-term rise in groundwater levels.

Table 4.1.18-1		
GROUNDWATER ELEVATIONS:	SITE	18
(FEET NGVD)		

Well_	Screened <u>Interval</u>	Feb. 1989	March 1989	May 1989	Aug. 1989	Nov. 1989
18-C-1	2 to -18	-1.06	0.19	1.25	2.10	3.39
18-C-2	9 to -11	2.72	3.07	4.06	4.85	5.90

May 1989 groundwater elevation contours plotted on wells in the southern part of Beale AFB are presented in Figure 4.1.18-4. Plate 3 provides groundwater contours for Beale AFB based on March 1989 data, while Plate 4 provides contours based on November 1989 data. These figures demonstrate that groundwater in the vicinity of Site 18 is flowing to the west, and appears to be controlled by the groundwater depression located west of the base. The gradient in May 1989 was about 0.006.

Aquifer parameters for the uppermost saturated permeable zone at Site 18 were derived from pump tests according to the Cooper-Jacob Method (1946) from the water level data generated during 6 hours of monitored drawdown and recovery in well 18-C-1, and 4 hours of monitored drawdown and recovery in well 18-C-2. Plots of the data and a discussion of



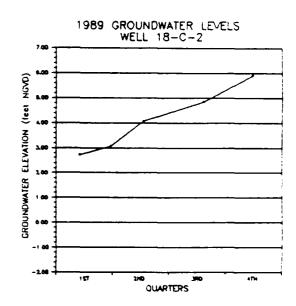
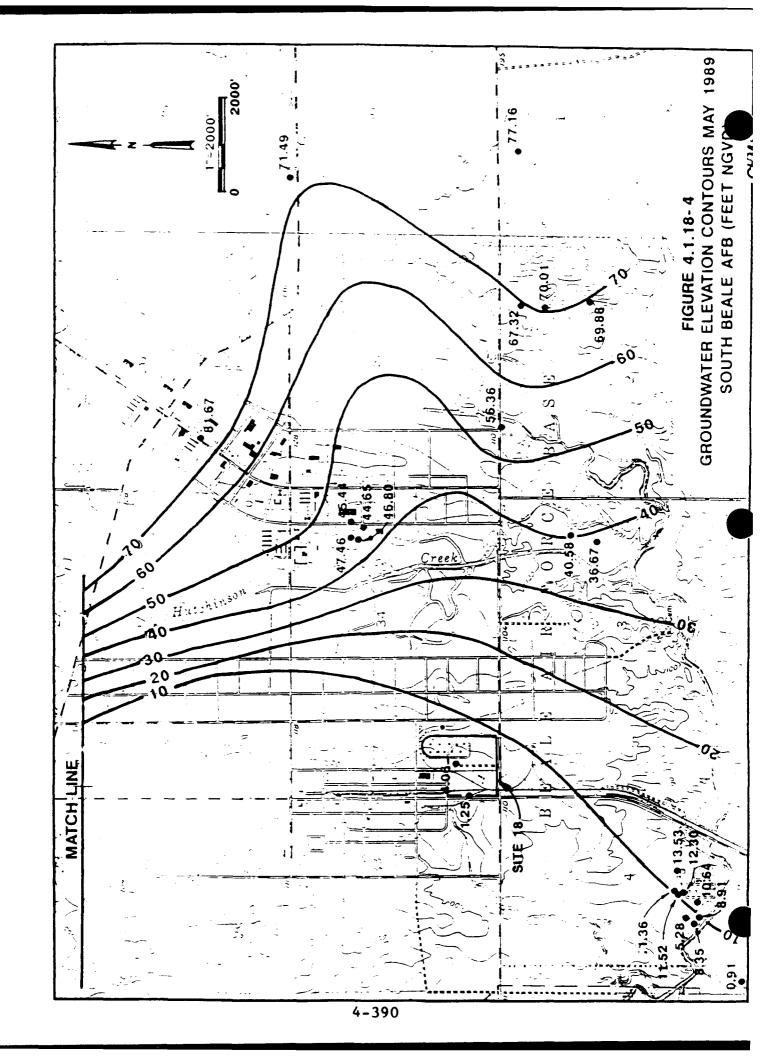


FIGURE 4.1.18-3

MONITORING WELL HYDROGRAPHS
SITE 18: BULK FUEL STORAGE FACILITY



testing methodology are provided in Appendix E. A summary of pump test results is shown on Table 4.1.18-2. The pump tests yielded an average value of transmissivity of 290 square feet per day, and an average value of hydraulic conductivity of 25 feet per day (8.8 \times 10 3 cm/sec). No water level change was observed in the other well at Site 18 during a test of a pumping well.

Table 4.1.18-2 SUMMARY OF RESULTS OF AQUIFER TESTING IN SITE 18 WELLS

Well	Date	Test	Transmissivity (ft²/d)	Hydraulic Conductivity (ft/d)
18-C-1	2/13/89	Drawdown Recovery	320 270	23 19
18-C-2	2/10/89	Drawdown Recovery Average:	230 330 290	24 34 25

An estimate of groundwater velocity near Site 18 may be made by substitution into Darcy's Law. Using the derived average value of hydraulic conductivity of 28 feet per day obtained during the 72-hour pump test at well 19-C-4, the calculated hydraulic gradient of 0.006, and an estimated effective porosity of 0.20, the groundwater velocity is about 0.8 feet per day, or 300 feet per year.

4.1.18.1.3. Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given with Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.18.1.4 and in Appendix A.

Soil

At Site 18, 22 surface soil samples were collected from within the AVGAS tank bermed area with two samples near each tank: one near the tank fuel water separator and one near the berm drain (18-C-1SS to -20SS, -23SS, and -24SS). Three samples (18-C-21SS, -22SS, and -25SS) were taken from the stormwater drainage ditch running south from the AVGAS tanks. Nine samples were taken from the railroad spur in the tank car unloading area: three samples (surface, 5, and 10 feet) from each of the three soil borings (18-C-1SB, -2SB, and -3SB) that were drilled on the tracks between railroad ties.

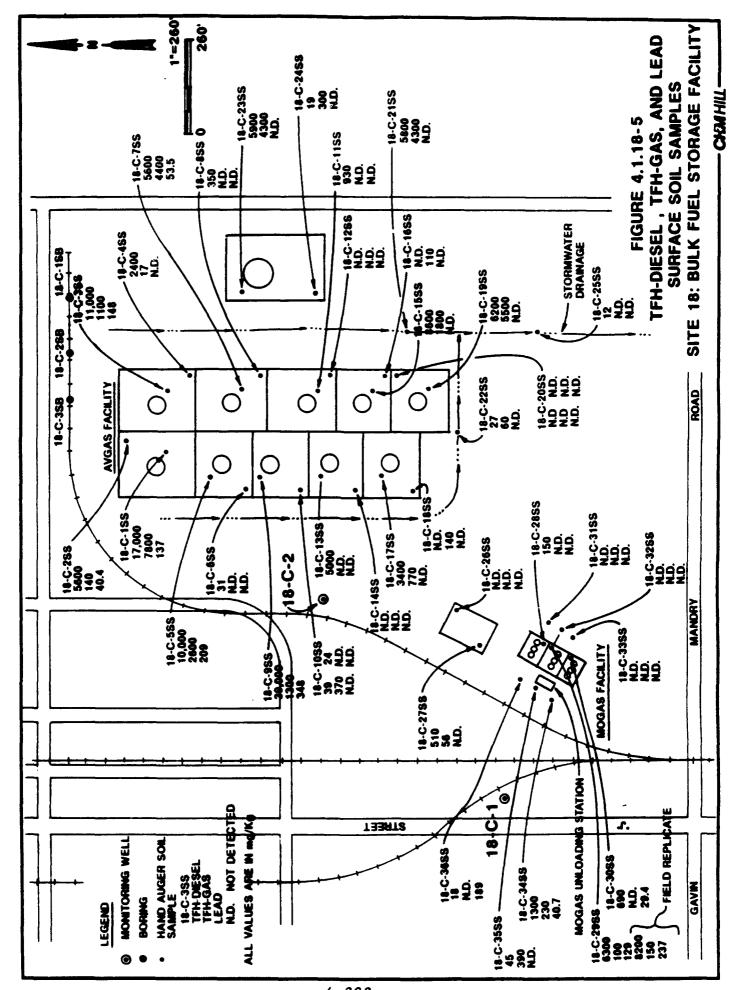
At the MOGAS facility south of the AVGAS tanks, 11 surface samples were taken: two samples in the unused bermed area north of the MOGAS tanks (18-C-26SS and -27SS), one sample from within each of the three MOGAS tank berm areas (18-C-28SS, -29SS, and -30SS), three samples where berm drainage is discharged to the east of the MOGAS tanks (18-C-31SS, -32SS, and -33SS), and three samples from the area west of the MOGAS unloading station (18-C-34SS, -35SS, and -36SS).

The surface soil and soil boring samples at Site 18 were analyzed for volatile organics (8240), ICP metals (6010), soil moisture (ASTM D2216) and TFH-diesel and -gas (California method).

TFH-diesel was detected throughout the AVGAS tank areas at from 24 to 39,000 mg/kg (Figure 4.1.18-5) except for non-detects in samples 18-C-12SS, -14SS, -16SS, -18SS, and -20SS, which were all taken near the berm drains in the southern part of the tank area. TFH-gas ranged from not detected to 7,800 mg/kg. In the stormwater drainage ditch samples south of the AVGAS tanks, TFH-diesel ranged from 12 to 5,800 mg/kg and TFH-gas ranged from not detected to 4,300 mg/kg.

In the bermed tank area at the MOGAS facility, TFH-diesel ranged from 150 to 8,200 mg/kg while TFH-gas was only detected in the center area at 100 mg/kg (150 mg/kg in replicate). TFH-diesel ranged from not detected to 1,300 mg/kg, and TFH-gas from not detected to 390 mg/kg outside the bermed tank area at the MOGAS facility.

Toluene was detected in most surface soil samples in the northern bermed AVGAS tank areas at 0.12 to 28 mg/kg and was either not detected or below the LOQ in the southern areas



and the stormwater drainage ditch (Figure 4.1.18-6). In the four northern and the eastern tank berm areas, chlorobenzene ranged from not detected to 11 mg/kg, ethylbenzene from not detected to 25 mg/kg, and total xylenes from not detected to 89 mg/kg. These three compounds were not detected at the six southern tanks or the stormwater drainage ditch.

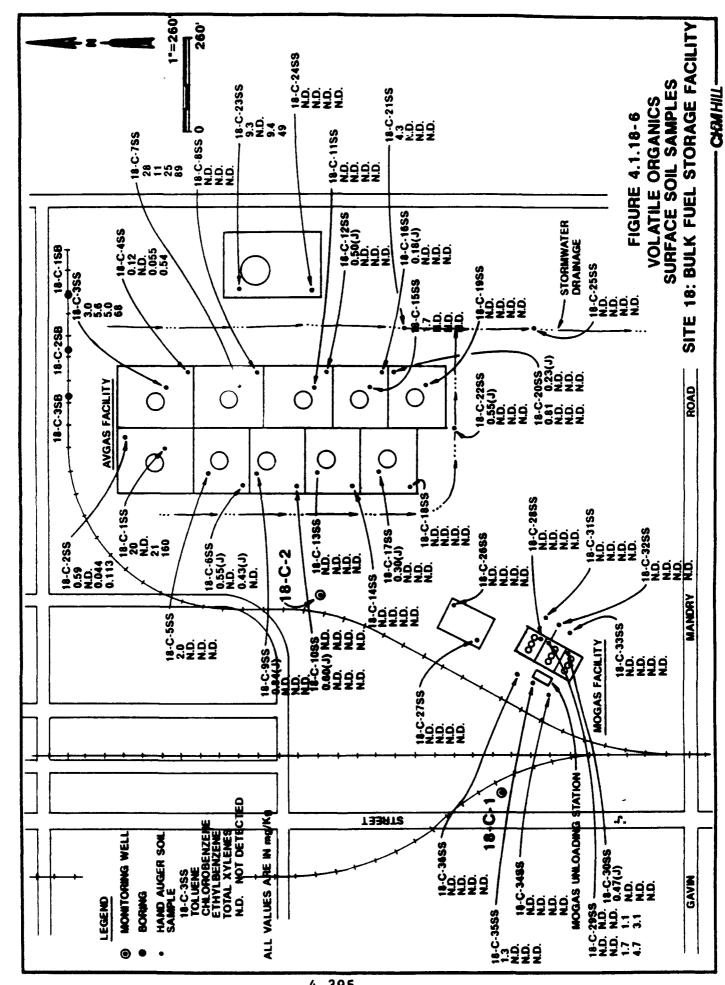
In the MOGAS surface samples, toluene was detected at 1.3 mg/kg in 18-C-35SS west of the tanks (Figure 4.1.18-6). Ethylbenzene and total xylenes were only detected in the center bermed tank area in sample 18-C-29SS at 1.7 and 4.7 mg/kg, respectively. Lead was detected in the two southern bermed tank areas at 129 mg/kg in sample 18-C-29SS which also had 140 mg/kg zinc (Figure 4.1.18-7). Lead was 29.4 mg/kg in 18-C-30SS. West of the MOGAS tanks, sample 18-C-34SS had 40.7 mg/kg lead and sample 18-C-36SS had 189 mg/kg lead and 316 mg/kg zinc.

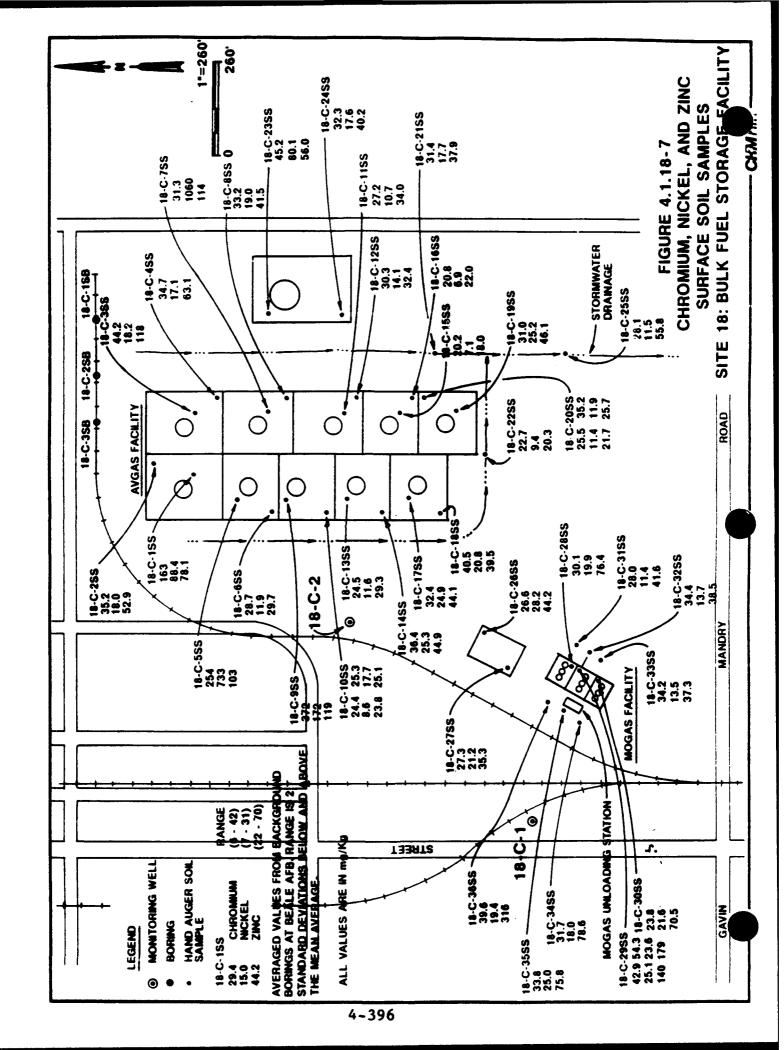
Lead, chromium, nickel, and zinc were detected in some surface samples at Site 18 at greater than two standard deviations above the mean concentrations measured in six background borings drilled at various locations at Beale. Figure 4.1.18-5 shows the distribution of lead in surface soil samples. Figure 4.1.18-7 shows the distribution of chromium, nickel, and zinc in surface soil samples.

Several samples taken near the fuel water separator at the northern AVGAS tanks had elevated metals concentrations (Figures 4.1.18-5 and 4.1.18-7). Lead, chromium, nickel, and zinc were detected at elevated levels compared to average concentrations for these metals from background soil borings on base. Manganese was detected at 11,200 mg/kg in 18-C-4SS. Magnesium was detected at 8,790 mg/kg in 18-C-1SS, 10,700 mg/kg in 18-C-5SS, and 13,300 mg/kg in 18-C-9SS. Other metals in soil at the AVGAS facility at Site 18 generally occurred at typical concentrations for Beale AFB.

Soil Borings

In the soil borings at the railroad spur (Figure 4.1.18-8), benzene was detected in the 10-foot sample at 18-C-2SB at 4.1 mg/kg and trans-1,2-DCE at 12 mg/kg. Ethylbenzene was detected in the surface and 5-foot samples at boring 18-C-1SB at 0.41 and 67 mg/kg, and in the 10-foot sample at 18-C-2SB at 17 mg/kg. TCE was detected at 2.2 mg/kg in the





ELEVATION IN FEET

5-foot sample at 18-C-3SB. Total xylenes were detected in the surface and 5-foot samples at 18-C-1SB at 1.6 and 280 mg/kg and in the 10-foot sample at 18-C-2SB at 17 mg/kg.

For soil borings at the railroad spur, lead was detected only in the boring 18-C-1SB replicate 10-foot sample at 37.7 mg/kg (Figure 4.1.18-9). TFH-diesel was detected at 450 to 52,000 mg/kg in all samples except the normal environmental sample at 10 feet at 18-C-1SB in which none was detected. TFH-gas was detected at 25 to 1,500 mg/kg in all samples except the 10-foot normal environmental sample at 18-C-1SB in which none was detected.

Groundwater

In the two semiannual rounds of water sampling at Site 18 during Stage 2-1, groundwater samples were collected from two new monitoring wells, 18-C-1 and 18-C-2, located west of the MOGAS and AVGAS tanks, respectively. Analyses performed for the groundwater samples were purgeable halocarbons (8010), purgeable aromatics (8020), ICP metals (6010), lead (7421), water quality parameters (various methods), and TFH-diesel and -gas (California method).

Toluene was detected in groundwater at Site 18 during the first quarterly sampling round (February 1989) of this investigation. In well 18-C-1 toluene was detected at 12 ug/1 (15 ug/1 in second column) and in well 18-C-2 at 3 ug/1 (3 ug/1 in second column). TFH-gas was detected at 0.80 mg/1 in well 18-C-1 and at 0.70 mg/1 in 18-C-2.

Zinc was detected at 0.023 mg/l in well 18-C-l west of the MOGAS tanks. Nickel was detected at 0.044 mg/l in well 18-C-2 west of the AVGAS tanks. Manganese was detected at 0.053 and 0.047 mg/l in 18-C-l and 18-C-2. TDS were 335 and 332 mg/l. Sodium (57.1 and 63.7 mg/l) and chloride (69.6 and 69.5 mg/l) concentrations at these wells are higher than most other sites at Beale AFB. Nitrite plus nitrate (expressed as nitrate) was 9.6 and 10.0 mg/l. Sulfate was 29.4 and 30.1 mg/l. Groundwater at Site 18 is a sodium chloride-bicarbonate type.

During the second semiannual sampling at Site 18 (third sampling round of Stage 2-1), toluene was detected at 2 ug/l (not confirmed in second column) in 18-C-1 and is considered to not be present. No other organic compounds or TFHs were detected during the third quarter sampling at Site 18.

4-399

Nickel was detected at 0.045 mg/l in 18-C-1. Manganese was detected at 0.016 and 0.024 mg/l. TDS were 336 and 354 mg/l in 18-C-1 and 18-C-2. Sodium (51.7 and 62.7 mg/l) and chloride (62.9 and 71.6 mg/l) concentrations in 18-C-1 and 18-C-2 were again higher than most other Beale sites. Nitrite plus nitrate (expressed as nitrate) was 8.6 and 7.0 mg/l. Sulfate was 65.0 and 43.2 mg/l.

4.1.18.1.4 Analytical Results Table

Table 4.1.18-3 presents a summary of all analyses and detected analytes for Site 18. Analytical data are also presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.18-3 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, and surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.18.1.5 Discussion of Analytical Data

Contaminants in the form of fuel hydrocarbons, chlorinated solvents, and metals were detected in soil samples collected within both tank farms and in the soil borings drilled through the railroad siding. Contaminants were also detected in groundwater samples. Table 4.1.18-4 presents the range of contaminants encountered for each of the media sampled (surface soil, soil, groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. Some of these detections may represent laboratory "noise" and the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study the LOQ is equal to the detection limit as defined in the QAPP.

TABLE 4.1.18-3

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 18

				Standards, and Action	Criteria Levels (a)	18-C-15S BAFB-0001	18-c-255 BAFB-0002	18-C-3SS BAFB-0003	18-C-4SS BAFB-0004	18-C-55S BAFB-0005	18-C-6SS BAFB-0006
Perameter	Method	Limit	Spits	Federal	State	11/15/88	11/15/88	11/15/88	11/15/88		11/16/88
Percent Moisture	ASAPP	K/H	×	SE	SE	15.4	16.5	12	18.2	16.2	15.8
TFH-Diesel	TFH-DI	1.0	mo/kg	SE	SE	17000	2600	11000	2400	10000	
TFN-Gas	75-EF	8	ø/ka	SE	S	2800	140	100	17	0092	
Atonina	\$46010	20.0	mo/kg	SE	SE	13500	7810	10700	11800	10200	
Berice	\$16010	10.0	e/kg	SH	10,000	171	5	110	900	101	
Calcium	Su6010	5	Z/kg	S#	SH	1930	2	2240	2020	2100	
Chronica	\$46010	3.0	Mo/kg	SH	20	591	35.2	4.2	¥.7	32	
Cobelt	Su6010	4.0	Z/ka	S	8,000	9.5	₽	10.1	9.5	17.9	
Copper	Su6010	3.0	Mo/kg	S#	2,500	992	18.0	22.8	22.2	21.5	
Iron	Su6010	10.0	Mo/kg	SH	SE	27800	18300	21000	21000	24700	•
Lead	Su6010	20.0	mo/ko	#S	1,000	137	40.4	148	2	82	
Negnesium	Su6010	5	MQ/kg	S#	SE	8790	2320	2910	2100	10700	
Nanganese	Su6010	1.5	2/kg	SI	Ş	% 2	5	54.5	11200	292	
Mickel	Su6010	0.4	Mo/kg	SH	2,000	7.88	18.0	18.2	17.1	733	
Potassium	\$16010	9 02	No/kg	SE	Ş	28	407	443	25	274	
Sodium	Su6010	5	20/kg	S	\$	526	5	142	153	171	
Venedium	Sta6010	0.4	mo/kg	S	2,400	52.0	55.1	55.1	63.4	52.0	
2 inc	Su6010	2.0	Me/kg	2	2,000	78.1	52.9	118 [8 63.1	B 103	
Methylene Chloride	SNB240	0.002	MO/kg	SI	SE	7.2	J 0.18	1.6.1	B 0.032	2.0	2
Acetone	S148240	0.010	10/k g	S	SE	7.7	J 0.10	2	0.032	2.0	2
2-Butanone	SMB 240	0.010	Me/kg	S	SE	2	2	2	2	2	
4-Nethyl-2-Pentanone	SMB 240	0.010	Me/kg	SH	SR	9	2	2	9	2	
2-Hexanone	SMB 240	0.010	mo/kg	S	Ş	2	9	9	a	2	
Toluene	SNB 240	0.002	Mo/kg	S	S	2	0.59	3.0	0.12	2.0	
Chlorobenzene	SMB240	0.002	No.	SE	SH	2	2	2.6	2	2	
Ethylbenzene	8MB 240	0.005	mo/kg	SI	SE	21	0.044	5.0	0.055	2	
Styrene	SNB240	0.005	mo/kg	SE	S	2	9	2	9	0.57	_
Xylenes (total)	S46240	0.002	mg/kg	MS	S	5	0.11	8	0.54	8	

NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank)

(): values listed in () are End column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Witrate + Witrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Witrate + Witrite given as Witrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

1ABLE 4.1.18-3 (continued)

		,		Standards, and Action	Criteria Levels (a)	18-C-755 BAFB-0007	18-C-65S BAFB-0008	18-C-955 BAFB-0009	18-C-1055 BAFB-0010	18-C-10SS	18-C-1155 BAFB-0012
Parameter	Method	Detection Limit	Units	Federal	State	0.0-1.01 11/16/88	0.0-1.0 11/16/88	11/16/88	11/16/88	11/16/88	11/16/86
Percent Moisture	ASAMO	W/M	æ	S	\$2	9.7	6.02 22	13.8	5	15.4	15.2
TFM-Diesel	TFN-DI	0.	mo/kg	S	*	2600	350	39000	8	%	86
1FX-Gas	75-57	S	ad/ka	SE	2	4400	9	1300	370	9	2
Atminu	\$16010	20.0	mo/kg	SE	SE	4710	14,800	23	2880	7120	92.9
Berice	S 46010	10.0	mo/kg	SE	10,000	40.1	9.79	8.5	ē	122	93.6
Calcium	S 46010	5	mo/kg	S	2	ē	1390	170	1140	1310	52.
Chromica	St.6010	3.0	10/kg	SE	8	31.3	33.2	372	7.42	28.3	27.2
Cobalt	S46010	4.0	Z/Kg	SE	8,000	14.4	6.3	17.4	13.1	16.5	1.1
Copper	SW6 010	3.0	Mo/kg	S	2,500	14.4	24.0	19.7	16.7	17.7	16.5
Iran	S 46010	10.0	M/ks	S	*	12500	28300	21300	16000	17100	1700
pee1	State 010	20.0	mo/kg	SE	00,	53.5	2	3 7	2	2	2
Negnesium	St.6010	5	Z/kg	£	*	1830	3250	13300	1390	1430	2020
Nananese	S 46010	1.5	7/kg	\$	£	6.09	<u>\$</u>	673	250	ž	92 3
Mickel	SW6 010	4.0	Z/kg	SH	2,000	090	19.0	122	9.8	17.7	10.7
Potassium	S46010	2	Mo/kg	S	S	9	2	929	524	8	25
Sodiu	SW6 010	5	76 X	SE	\$	151	147	\$ 1	2	9	2
Vanadium	State 010	0.4	7/KG	2	2,400	7.82	73.7	46.2	49.5	52.5	55.4
Zinc	SW6010	2.0	Z/ko	S	s, 000	14	41.5	119	23.8	×	٠ ۲
Methylene Chloride	SMB 240	0.00	Toks	2	=	6.4	1 0.63	9	2	0.7	BJ 0.42 BJ
Acetone	SMB 240	0.010	mo/kg	*	Ş	8.9		2	2	2	욮
Toluene	SuB240	0.005	Z/kg	S	S	8	9	0. 8	3.0	9	9
Chlorobenzene	SMB 240	0.00	Z/ko	\$	*	=	2	2	2	2	2
Ethylbenzene	SMB 240	0.00	me/kg	\$	\$	X	9	2	2	2	9
Xylenes (total)	\$116 240	0.002	Mo/kg	S	*	8	9	9	9	9	2
										:	

MOTES: Results raported for detected analytes only.

MT: analyte not tested

MD: analyte not detected.

MD: detected is analyte not detected.

MD: detected.

MD: detected in blank

MD: detected.

MD: detected in blank

MD: detected.

MD: detected.

MD: detected in blank

MD: detected.

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.18-3 (continued)

				Standards, and Action	Criteria Levela (a)	18-C-128S	_				
Perameter	Method	Detection Limit	Site	Federal		0.0-1.0.	0.0-1.0	0.0-1.0° 11/16/88	11/16/88	0.0-1.0	0.0-1.0
Percent Moisture	OFFE V	M/M	×	2	SE	21.8	22.6	9 .8	10.9		19.6
TFE-Diesel	16H-07	1.0	ma/kg	S	2	2	2000	9	9600	2	8 8
TFH-Gas	TFU-64	2	Z/Ko	*	\$	9	9	2	1800		2
	010976	20.02	2	2	*	10500	9259	5	6,610		13200
Berita	01034	10.0	sy/s	S	10,000	9.8	97.5	171	8.6		Ž
	010348	100	1/kg	S	\$	18,0	1280	99%	1060		3220
	01034	3.0	Z/Ko	S	8	30.3	24.5	7.92	20.2		32.4
Cobell	01034	9	me/ko	S	9,000	14.1	11.4	13.9	7.2		11.8
Comer	010375	3.0	7	S	2,500	20.5	15.5	25.3	12.3		6.92
100	01034	10.01	av/ka	*	S	23500	14300	26900	11800		2220
Meaneries	01034	9	e / ke	2	*	2430	1560	4390	1050		0607
Menanana	010342	5.	e/ka	*	*	519	Ř	98 2	287		ž
Hickel	010348	4	es/ke	1	2,000	14.1	11.6	25.3	7.1		24.9
Pot see in	010975	92	/k	2	2	512	33	3	348		27.4
Sodia	010348	9	/ke	*	S	<u>3</u>	2	6 22	2		214
Vecesion	010978	4	/s	SI	2,400	67.5	43.2	80.5	37.7		62.5
2,100	010975	2.0	2/2	S	2,000	32.4	29.3	6.73	18.0		-: \$
Methylane Chioride	S46240	0.005	Z/ka	2	*	26.0	9	2	0.38	2	3.0
Tolinge	S46240	0.005	/ko	2	*	0.50	2	2	1.7		S.0.3

MOTES: Results reported for detected analytes only. NT: smalyte not tested MD: analyte not detected.

B: ammlyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

MS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.

b: The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

Detaction limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

e: equipment wash blank f: field replicate R: resample

TABLE 4.1.18-3 (continued)

				Standards, and Action	Criteria Levels (a)	18-C-18SS BAFB-0019	18-C-1955 BAFB-0020	18-C-20SS BAFB-0021	18-C-2055	18-C-21SS BAFB-0024	18-C-2255 BAFB-0025
Parameter	Method	Limit	Units	Federal	State	11/17/88	11/17/88	11/17/88			
Percent Moisture	ASAMP	Y/N	×	SE	SE	R	19.8	16.9	91	50.9	16.3
TFH-Diesel	TFN-DI	1.0	mg/kg	SE	SH	2	9700	2	2	2800	27
TFH-Gas	TFH-GA	2	mo/kg	SH	SH	140	2200	2	9	4300	3
Alumina	S 26010	20.0	mo/kg	SH	SH	16100	12100	979	9390	13000	2200
Berice	S 26010	10.0	mo/kg	SE	10,000	165	131	8.3	8.7	126	73.0
Calcium	Stu6010	5	mo/ko	SE	SE	2220	3750	1340	120	2410	1520
Chronica	Stu6010	3.0	mo/ko	SE	8 8	40.5	31.0	25.5	35.2	31.4	22.7
Cobalt	St.6010	0.4	ma/ka	S	9,000	16.9	12.5	6.0 80	11.4	7.9	6.6
Copper	Suc 6010	3.0	mg/kg	SE	2,500	7.52	27.6	24.1	20.5	32.2	14.3
5	S 46010	10.0	Me/kg	SE	SH	24800	23600	15500	18100	23500	14800
Megnes i un	Stu6 010	<u>5</u>	Mo/kg	S	SE	3340	3980	1700	- - - - - - - - - - - - - - - - - - -	3240	1430
Handanese	Stat6010	1.5	mo/kg	SE	SH	843	476	233	307	\$	*
Mickel	SW6010	4.0	Me/kg	SE	2,000	20.8	25.2	11.4	11.9	17.7	7.6
Potassium	Sta6010	8	mo/ka	SE	SE	53	11,	349	512	607	424
Sodice	SW6010	2	Z/kg	SE	SI	2	201	2	2	1 00	¥
Vanadius	SW6010	6.0	mo/kg	SZ	2,400	58.1	24.5	52.1	55.5	£.5	45.5
Zinc	Sw6010	2.0	Mo/kg	SE	2,000	39.5	46.1	21.7	25.7	37.9	20.3
Nethylene Chloride	SM8240	0.00	mo/ko	S¥	S#	2.7	3 2.6	8 2.6	8 2.1	8 2.5	8 2.4
Toliman	072975	0.005	May/ka		S	9	9	0.81	0.23	1.4	0.55

NOTES: Results reported for detected analytes only.

NT: analyte not tested

NT: analyte not detected.

NT: analyte not detected.

ND: field blank (ambient condition blank)

RD: resample

ND: values listed in () are 2nd column confirmation values.

ND: values represent most stringent standard, criteria or action level. See Appendix I.

ND: values represent most stringent standard of 45 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

e: equipment wash blank f: field replicate R: resample

for Mitrate + Mitrite given as Mitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.18-3 (continued)

		;		Standards, and Action	Criteria Levels (a)	18-C-23SS BAFB-0026	18-C-24SS BAFB-0027	18-C-25SS BAFB-0028	18-C-26SS BAFB-0040	18-C-27SS BAFB-0041	18-C-28SS BAFB-0042
er emet er	Method	Detection Limit	Units	Federal	State	11/17/88	11/17/88	11/17/88			
ercent Moisture	ASAEP	N/N	*	SH	SE	4	20.4	19.2	18.1	10.5	19.5
FR-Diesel	TEM-DI	1,0	mo/kg	SE	SE	2800	5	12	욮	510	150
FII-Gas	TFH-GA	20	mo/kg	SE	SH	4300	300	₽	윺	26	2
Laine	St46010	20.0	ma/ka	SZ	SI	14600	12900	0999	0666	8490	12700
	St46010	10.0	MQ/kg	SE	10,000	162	98.0	82.2	65.0	S. 8.	35 1
	SW6010	5	mo/ko	SE	SI	1840	2760	1510	2650	2770	3700
Chromium	SW6010	3.0	mo/ko	SE	200	45.2	32.3	28.1	56.6	27.3	30.1
phel t	SU6010	0.4	ma/ka	SE	8,000	8.5	12.6	8.7	9.9	7.9	11.2
Jaggo	SW6010	3.0	mo/ko	SE	2,500	30.7	27.6	14.9	19.5	17.9	26.8
	SW6010	10.0	ao/ka	SE	SH	24600	26900	14700	15300	15600	20602
pea	Sta6010	20.0	Mo/kg	SE	1,000	138	2	9	£	윺	2
names i un	SW6010	9	mo/ka	SE	SH	3720	3680	1710	4750	3390	3520
andanese.	SW6010	1.5	mo/kg	SZ	SH	227	387	213	189	270	327
ickel	SW6010	0.4	mo/ko	S	2,000	8	17.6	11.5	28.2	21.2	19.9
ptestium	SW6010	8	mo/ko	SE	SH	642	594	38	757	247	167
polite	SW6010	5	ma/ka	SE	SE	174	187	웆	173	165	5
anadica.	SW6010	4.0	MQ/kg	SE	2,400	6.09	78.3	42.7	30.0	33.1	56.9
1	SW6010	2.0	mg/kg	SZ	2,000	26.0	40.2	55.8	44.2	8 35.3	B 76.4
ethylene Chloride	SW8240	0.005	mg/kg	SE	SH	3.1	3.6	3.1	B 0.85	8 0.78	6.73
retore	SIMB240	0.010	mo/kg	SE	S	2	3	욮	윺	0.82	BJ 0.91
2000	SMB240	0.005	mg/kg	SZ	SE	9.3	皇	2	2	9	욮
thylbenzene	SW8240	0.005	mg/kg	SE	SE	7.6	2	2	윺	윺	₽
vienes (total)	SW8240	0.005	mo/ko	SE	SE	64	2	2	₽	욮	2

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteris or action level currently exists.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.18-3 (continued)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	- - - - - - - - - - - - - - - - - - -			Standards, I	Criteria Levels (a)	18-C-29SS BAFB-0043	18-C-29SS	18-C-30SS BAFB-0046	•	≃ ∞	18-C-33SS BAFB-0049
Parameter	Method	Detection Limit	Units	Federal	State	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0° 11/22/88	0.0-1.0' 11/22/88	0.0-1.0' 11/22/86
Derrent Moietine	OWAZA	W/W	м	SZ	SE	14	19.4	15.7	13.3	12.2	=
TEXTO DISCUSSION OF TEXTON	TFM-DI	1.0	ma/ka	SN	SE	9300	8200	069	윺	2	2
TENCOP	TEM-GA	20	a/ka	S	SE	5	150	윺	2	윺	욮
	01034	20.02	o/ko	S	SE	12800	10600	9630	2600	0066	0756
	246010	10.0	o/ko	S	10,000	502	215	18	<u>\$</u>	139	130
Peryl in	010978	0.50	ø/ka	SE	ĸ	욡	윺	2	2	0.57	윤
	S46010	8	p/ka	SE	SE	3480	3360	3610	1670	1920	2040
	010375	3.0	mo/ko	SE	200	42.9	54.3	23.8	28.0	7.7	34.2
Spel 4	20010	0.4	o/ka	S	8,000	11.3	12.3	7.6	11.2	26.0	12.4
	010978	0	o/ka	S	2,500	30.8	29.5	24.9	15.0	18.2	16.9
1500	010348	0.01	o/kg	S	SE	20600	18400	17700	17600	22300	19600
5 -	Su6010	20.02	mo/ko	SE	1,000	52	237	4. &	2	웆	윺
Memorita	Su6010	90	mo/ka	SE	SZ	34.73	3190	3198	2040	2690	2180
Managana	S-46010	5.	d/ka	S	SE	88	27	8	288	92	34.4
Richel	Su6010	7	mo/ko	SE	2,000	25.1	23.6	21.6	11.4	13.7	13.5
Botsesin	Suco10	002	mo/ka	SE	SH	944	1.74	356	415	8	6 %
Sodie	Su6010	5	mo/kg	SE	SE	524	216	187	123	74	142
Venedin	SU6010	0.4	mo/ko	W	2,400	55.2	56.2	47.3	56.1	62.2	57.8
2 ioc	Su6010	2.0	mo/kg	SE	2,000	140	22	70.5	41.6	38.5	37.3
Methylene Chioride	SM240	0.00	mo/kg	SE	SZ	0.48	13 0.63	BJ 0.51	BJ 0.48	BJ 0.62	8) 0.48 8)
Tolume	SuB240	90.00	MQ/Kg	SE	SZ	≘	욮	0.47	유 구	윺	2
F thy henzene	SM6240	0.002	mo/kg	SE	SE	1.7		2	윺	皇	£
Xylenes (total)	SMB240	0.005	7 Kg	SM	SE	4.7	3.1	2	2	2	2

MOTES: Results reported for detected analytes only.

MI: analyte not tested
MD: analyte not tested
MD: analyte not detected.
MD: detected.
MD: analyte not detected.
MD: detected.
MD: detected in it is equipment was blank blank analyte not in Appendix I.
MD: detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

TABLE 4.1.18-3 (continued)

Parameter Mr-thod Limit Units Federal Percent Moisture ASA#9 M/A X MS TFH-Dissel TFH-Di 1.0 mg/kg MS TFH-Gas TFH-Di 1.0 mg/kg MS Aluminum SM6010 20.0 mg/kg MS Aluminum SM6010 10.0 mg/kg MS Aluminum SM6010 10.0 mg/kg MS Calcium SM6010 10.0 mg/kg MS Chromium SM6010 3.0 mg/kg MS Copper SM6010 10.0 mg/kg MS Lead Marghesium SM6010 10.0 mg/kg MS Norderium SM6010 10.0 mg/kg MS Norderium SM6010 1.0 mg/kg MS Sodium SM6010 1.0 mg/kg MS Sodium SM6010 2.0 mg/kg MS		State 11, 88 8, 900 2, 500 8, 000 2,	16.22/88 11/22/88 16.22/88 16.22/88 23.9 1300 14800 156 150 2340 4340 33.8 10.9 18.4 35.0 40.6 20900 20900 20900 235.0 6080 235.0 746.0 6080 235.0 6080 235.0 746.0 6080 235.0 746.0 6080 235.0 746.0 6080 235.0 746.0	25 17.6 18.9 17.6 18.9 19.6 19.9 19.6 19.9 19.6 19.9 19.6 19.9 19.6 19.9 19.9	11.9 3300 530 530 5700 92.3 1230 23.5 12.5 18.2 16100 1930	24 10000 630 13800 239 3370 26.3 13.2 41.4 24.4 25400 80 4630	25.9 25.9 17000 177 3990 30.4 13.5 53.8 30400 678
oisture ASAMP N/A I TFN-D1 1.0 TFN-D1 1.0 TFN-D1 1.0 SW6010 20.0 SW6010 3.0 SW6010 3.0 SW6010 10.0 SW6010 10.0 SW6010 10.0 SW6010 10.0 SW6010 1.5 SW6010 2.0 SW6010 0.005 SW6240 0.005	2	10,000 10,000 2,500 1,000 2,000 1,000 2,000			11.9 3300 530 5700 92.3 12.5 12.5 18.2 16.100 1930	24 10000 13800 13800 13800 13.2 13.2 41.4 24.0 24.0 24.0	25.9 17000 1770 3990 3990 13.5 53.8 53.8 50.00 57.80
TFN-D1 1.0 SW6010 20.0 SW6010 10.0 SW6010 3.0 SW6010 3.0 SW6010 10.0 SW6010 0.005 SW6010 0.005	2	10,000 10,000 8,000 2,500 1,000 1,000 2,000			3300 530 5700 92.3 1230 12.5 18.2 16100 1930	19000 13800 13800 1370 26.3 13.2 41.4 23400 6330	17000 17000 3990 30.4 13.5 53.8 30400 6780
TFN-GA 50 SM6010 20.0 SM6010 10.0 SM6010 3.0 SM6010 4.0 SM6010 10.0 SM6010 0.005 SM6240 0.005	2	10,000 8,000 2,500 1,000 2,000 1,000 2,000			530 5700 92.3 1230 23.5 12.5 16.100 1930	630 13800 13800 1370 26.3 13.2 41.4 23400 630 4630	1700 177 177 13.5 13.5 53.8 50.00 10 57.00 57.00
SM6010 20.0 SM6010 10.0 SM6010 10.0 SM6010 3.0 SM6010 3.0 SM6010 10.0 SM6010 10.0 SM6010 10.0 SM6010 10.0 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.0 SM6010 1.0 SM6010 1.5 SM6010 1.0 SM6010 1.0 SM6010 1.0 SM6010 1.0 SM6010 0.00 SM6010 0.005 SM6240 0.005	20/40 20/40	NS 10,000 10,000 2,500 1,000 2,000 2,000 2,000 2,000 2,000 2			5700 92.3 1230 23.5 12.5 18.2 16100 1930	13800 239 2370 26.3 13.2 41.4 23400 80 4330	17000 177 177 13.5 13.5 13.6 30400 180 578 6.3
\$M6010 10.0 \$M6010 10.0 \$M6010 10.0 \$M6010 3.0 \$M6010 3.0 \$M6010 10.0 \$M6010 10.0 \$M6010 10.0 \$M6010 1.5 \$M6010 1.0 \$M6010 1.5 \$M6010 1.0 \$M601	20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg	10,000 MS S00 2,500 1,000 1,000 2,000			92.3 1230 23.5 12.5 18.2 16100 1930	239 26.3 13.2 41.4 23400 80 4330	177 3990 30.4 13.5 53.8 30400 80 5780
SM6010 100 SM6010 3.0 SM6010 3.0 SM6010 3.0 SM6010 10.0 SM6010 10.0 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.5 SM6010 1.0 SM6010 1.0 SM6010 1.0 SM6010 0.005 SM6010 0.005 SM6240 0.010	20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg 20/kg	8,000 2,500 1,000 1,000 2,000			1230 23.5 12.5 18.2 16100 ND	3370 26.3 13.2 41.4 23.400 80 4630	3990 30.4 13.5 30400 57.8 5.4 5.4 5.4 5.4
SM6010 3.0 SM6010 4.0 SM6010 10.0 SM6010 10.0 SM6010 10.0 SM6010 1.5 SM6010 1.5 SM6010 4.0 SM6010 4.0 SM6010 4.0 SM6010 4.0 SM6010 0.005 SM6010 0.005 SM6240 0.010	20/kg	500 8,000 2,500 1,000 1,000 2,000			23.5 12.5 18.2 16100 M	26.3 13.2 41.4 23400 10 10 10 4630	30.4 13.5 30400 57.8 5.4 5.4 5.4 5.4
SW6010 4.0 SW6010 3.0 SW6010 10.0 SW6010 10.0 SW6010 1.5 SW6010 1.5 SW6010 1.5 SW6010 1.5 SW6010 1.0 SW6010 1.0 SW6010 2.0 SW6010 2.0 SW6010 0.005 SW6010 0.005 SW6010 0.005	20/kg	8,000 2,500 1,000 NS NS 2,000			12.5 18.2 16100 ND 1930	13.2 41.4 23400 80 4630	13.5 53.8 30400 80 5780
SN6010 3.0 SN6010 10.0 SN6010 10.0 SN6010 10.0 SN6010 1.5 SN6010 1.5 SN6010 4.0 SN6010 2.0 SN6010 4.0 SN6010 2.0 SN6010 0.005	20/kg	2,500 1,000 1,000 8,500 2,000			18.2 16100 ND 1930	41.4 23400 80 4630	53.8 30400 80 5780
SN6010 10.0 SN6010 20.0 SN6010 100 SN6010 1.5 SN6010 1.5 SN6010 4.0 SN6010 4.0 SN6010 4.0 SN6010 4.0 SN6010 6.00 SN6010 6.005 SN6240 0.010 SN6240 0.010	10/kg 18 18 18 18 18 18 18 18 18 18 18 18 18	1,000 1,000 18 18 2,000		-	16100 M 1930	23400 8630 8630 73	30400 5780 5780
SM6010 20.0 SM6010 100 SM6010 1.5 SM6010 1.5 SM6010 4.0 SM6010 200 SM6010 4.0 SM6010 4.0 SM6010 2.0 SM6010 2.0 SM6010 2.0 SM6010 2.0 SM6240 0.005 SM6240 0.010	70/kg 85 85 85 85 85 85 85 85 85 85 85 85 85	1,000 NS NS 2,000			09 1930	9 0894 9 0897	575 0875 780 780
SM6010 100 SM6010 1.5 SM6010 1.5 SM6010 4.0 SM6010 200 SM6010 4.0 SM6010 2.0	20 / Kg	2,000 2,000			1930	0£9 7	5780 5.3
SN6010 1.5 SN6010 4.0 SN6010 6.0 SN6010 100 SN6010 4.0 SN6010 4.0 SN6010 2.0 SN6240 0.005 SN6240 0.010 SN6240 0.010	10/kg 18 18 18 18 18 18 18 18 18 18 18 18 18	NS 2,000				24.7	6
SM6010 4.0 SM6010 200 SM6010 100 SM6010 100 SM6010 4.0 SM6010 2.0 SM6010 2.0 SM6240 0.005 SM6240 0.005 SM6240 0.005	MG/kg NS NS MG/kg NS	2,000			353	A I P	•
SM6010 200 SM6010 100 SM6010 4.0 SM6010 2.0 SM6240 0.005 SM8240 0.010 SM8240 0.010	MQ/kg NS	•			7.8	27.8	27.8
SM6010 100 SM6010 4.0 SM6010 2.0 SM6240 0.005 SM6240 0.010 SM6240 0.010	SM CALCON	200			318	382	931
SM6010 4.0 SM6010 2.0 SM6240 0.005 SM6240 0.010 SM6240 0.010 SM6240 0.005		SE			115	313	316
SM6010 2.0 SM6240 0.005 SM6240 0.010 SM6240 0.005 SM6240 0.005	mg/kg NS	2,400			51.2	58.9	81.9
SM6240 0.005 SM6240 0.010 SM6240 0.005 SM6240 0.005	mg/kg NS	2,000			24.4	53.9	66.5
SM8240 0.010 SM8240 0.005 SM8240 0.010	mg/kg NS	SE	60	60	B 0.082 B	₽	0.036
SM8240 0.005 SM8240 0.010	mg/kg NS	SE		9	0.15	5	0.023 B
Su6240 0.010	mg/kg MS	SE	<u>-</u>	9	0.022 J	2	0.005
0000	mg/kg MS	Ş	₽	9	욮	2	0.008
20.0	mg/kg NS	Ş	<u>-</u>	9	0.16	21	2
SN8240 0.005 II	mg/kg MS	S	9	 E	0.039	9	0.020
su8240 0.005 a	mg/kg NS	SE	-	3	0.091	₹	£
0.002	mg/kg NS	SE	₽	9	0.41	29	2
1) SW8240 0.005 II	mg/kg NS	SH	2	9	7.0	윺	2
(p) SW6240 0.005 II	mg/kg NS	Ş	<u>-</u>	9	0.87	2	9
nes (total) SM6240 0.005 m	mg/kg ws	S	<u>-</u>	9	1.6	580	₽

NOTES: Results reported for detected analytes only.

NI: analyte not tested

NI: analyte rot tested

NI: analyte rot tested

NI: analyte rot detected.

NI: analyte rot detected in blank

NI: analyte rot detected in limits.

R: resample

A: Nalues represent most stringent standard, criteria or action level. See Appendix I.

* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l

for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

				Standards, Cland Action Lo	Criteria Levels (a)	18-C-158 ⁽ BAFB-0356	18-C-25B BAFB-0357	18-C-258 BAF8-0358	18-C-258 BAFB-0359	18-C-358 BAFB-0360	18-C-358 BAF8-0361
	Het to M	Detection	<u>.</u>		State	11.5-13.0	1.5-3 01	5.0-6.5	10.0-11.5	1.0-2.5	5.0-6.5
	- 1	, III.	9					10/50/10	20/20/10	20000	20/20/10
Percent Moisture	ASA#9	W/A	×	SH	Ş	28.4	11.7	12	19.2	12.1	21.4
TFH-Dieset	TFM-DI	1.0	mg/kg	SH	SH	1200	11000	450	12000	22000	4700
TFH-Gas	7FH-62	20	Hay/kg	SX	SH	029	1000 0001	£	1200	1500	820
Alumina	SU6 010	20.0	MO/kg	SI	SH	25800	9830	2560	13100	7820	11200
Barium	S146 010	10.0	Mo/kg	SH	10,000	233	169	26.1	163	158	305
Beryllium	Su6010	0.50	10/kg	SH	ĸ	9	R	2	2	€	0.76
Calcium	Sta6010	5	10/kg	SH	SN	5730	2220	1190	2710	1990	3220
Chromium	Su6010	3.0	mo/kg	SN	200	39.4	¥.0	27.2	31.7	27.4	22.9
Cobalt	Su6010	6.0	mo/kg	S¥	8,000 8	22.3	7.6	10.9	8.4	9.6	16.5
Copper	Su6010	3.0	MQ/kg	SW	2,500	53.8	7.62	26.1	35.9	22.8	32.7
Iron	Suc 010	10.0	MO/kg	SE	SE	36000	21400	15700	25700	17700	18100
Leed	Su6010	20.0	10/kg	SN	- 00,	37.7	2	2	윤	2	9
Magnesium	Su6010	5	MO/kg	SE	S	8510	2930	1350	3970	2450	677
Manganese	Su6010	1.5	mo/kg	SH	S	1150	274	520	349	307	211
Hickel	Su6010	4.0	MQ/kg	SN	2,000	43.4	18.1	9.0	19.8	14.8	29.3
Potassium	SM6010	0 02	MQ/kg	SE	SE	1190	775	994	027	375	2
Sodium	Su6010	5	MO/kg	SE	SZ	363	127	5	193	108 80	1 2
Vanadium	SW6010	4.0	MQ/kg	SN	2,400	88.5	61.7	52.6	7.69	57.1	51.9
2 inc	SW6010	2.0	MQ/kg	SE	2,000	9.6	36.2	24.8	9.77	30.0	39.3
Methylene Chloride	SN8240	0.002	MQ/kg	NS NS	SI	0.024	0.058	0.057	34.1	8.4.8	4.28
Acetone	SH8240	0.010	mg/kg	SE	S	0.018	9 0.19	0.077	2	3.6	3.7
Carbon Disulfide	SM8240	0.002	mg/kg	SE	SZ	₽	2	2	2.2	0.50	0.48
trans-1,2-Dichloroethene	SM8240	0.002	mg/kg	SE	SE	2	윺	2	12	웊	9
Chloroform	SMB240	0.00	84/9m	SE	SZ	0.006	9	2	9	웆	2
2-Butanone	SMB240	0.010	10 /kg	SE	SZ	윺	0.093	2	2	%.0	7.1.
Trichloroethene	SM8240	0. 0.	Mo/kg	SH	2,040	욮	2	2	8	¥	2.2
Benzene	SMB240	0. 0.	20/kg	S¥	S	2	9	۽	4.1	욡	윺
Toluene	SW8240	0.00	MO/kg	SE	SE	0.052	2	0.025	2	2	0.43
Ethylbenzene	SNB240	0.00	m g/kg	¥	SE	£	2	2	17	욯	윺
Xylenes (total)	SMB240	0.005	mg/kg	SR	S	2	욡	욮	17	9	유

e: equipment wash blank f: field replicate R: resample MI: analyte not tested
MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected.

MD: field blank (ambient condition blank)

MD: field blank (ambient condition blank (ambient condition blank)

MD: field blank (ambient condition blank (amb WOTES: Results reported for detected analytes only.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. for Mitrate + Mitrite given as Mitrate.

TABLE 4.1.18-3 (continued)

				and Action Levels (a)	evels (a)	8AFB-0362
Perameter	Method	Detection	Unite	Federal	State	01/03/89
Decreet Moisture	OFFE	W/W	×	S¥	SE	22.5
TEH-Diocel	TEM-DI	1,0	mo/ko	S	HS	35000
TEN-COPE.	164-E	2	a/ka	SE	SE	8 4
18,5	010978	20.0	mo/ko	Ş	S#	15500
	010976	10.0	ez/ko	SE	10,000	325
	010978	9	a/ko	S	SH	3380
	010978	3,0	Mo/kg	S#	90 90 90	30.2
i etc	Succo10	0.4	mo/ko	Ş	8,000	21.9
11877	010971	0.K	ø/ko	SE	2,500	52.4
100	010973	10.0	mo/kg	Ş	SI	32000
Magnesium	010348	8	ez/ko	SE	S	5210
Mendensee	S16010	1.5	mo/kg	SE	SH	57
Mickel	SW6010	4.0	mo/kg	SH	2,000	37.9
Sodium	S16010	5	MA/Kg	S	SE	226
Variable	2010978	0.4	MQ/kg	SH	2,400	92.6
Zine	S16010	2.0	ma/kg	SH	2,000	54.8
Methylene Chioride	SUB240	0.00	mo/kg	S	SE	2.8 8
Acetone	SAR240	0.010	mo/kg	SE	SE	2.1
Toluene	\$148240	0.002	mo/kg	S	¥	0.65 J

MOTES: Results reported for detected analytes only.

MI: analyte not tested

MI: analyte not tested

MI: analyte not detected.

MI: field replicate

MI: field replication limit

MI: field replicate

MI: field replication limit

MI: field replicate

MI: field replication limit

MI

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.18-3

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 18

				Standards, Candards, Canda	Criteria Levels (a)	18-C-1GW	18-C-2GW
Parameter	Method	Detection	Units	Federal	State	02/14/89	6Ar8-0448 02/13/89
Specific Conductivity	E120.1	1.0	Carbos/Ca	SZ	8	38	607
Temperature	£170.1	*	၁ geb	S	SE	19.0	21.1
. .	E150.1	4/ 4	T	5-9	SE	6.8¢	7.07
Alkalinity - Total	SH4 03	1.0	7	2	SE	79.5	87.6
Bicarbonate	SP# 63	1.0	7	SZ	SH	8.6	106.9
Total Dissolved Solids	E160.1	3.0 8.0	Ž	200	200	335	332
Chloride	E325.3	1.0	7	220	22	9.69	69.5
Fluoride	E340.2	0.020	7	~	1.4	0.23	0.27
Mitrate + Mitrite	E353.3	0.020	7	5	5 7	9.6	10.0
Sulfate	E375.4	1.0	1/2	250	220	7.62	30.1
TFH-Ges	TFH-GA	0.10	7	¥	SE	0.80	0.70
Calcium	Su6010	2.8	7	SE	SN	22.1	19.0
Nagnes i un	Su6010	- 8	7	S	SZ	10.3	7.86
Nanganese	Su6010	•	1/2	કં	સં	0.0530	0.0470
Mickel	Su6010	0.0400	1/2	91.	4.	2	0.0440
Potassium	Su6010	0	\ /	SE	ST	2.10	1.40
Sodium	SM6010	- 8	1	¥	SH	57.1	63.7
Zinc	Su6 010	0.0200	7	0.110	0.012	0.0230	9
Toluene	SNB 020	-	7	14,300	5	12(15)	3(3)

MOTES: Results reported for detected analytes only.

MIT: analyte not tested

MIT: analyte not tested

MIT: analyte not tested

MIT: analyte not tested

MIT: analyte not detected.

MIT: analyte not detected.

MIT: analyte not detected.

MIT: analyte not detected in blank

MIT: analyte not detected.

MIT: analyte not detected in blank

MIT: analyte not detected.

MIT: analyte not detected in blank

MIT: analyte not detected in blank

MIT: analyte not detected in blank

MIT: analyte detection limits. Actual detection limits for each analysis are given in Appendix A.

MIT: analyte not detected in blank

MIT: field replicate

MIT: field replication limit field

TABLE 4.1.18-3

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 18

				Standards, C and Action L	Criteria Levels (a)	18-C-1GU	18-C-2GM	
Parameter	Nethod	Detection Limit	L Units	Federal	State	BAFB-0616 08/30/89	BAFB-0617 08/31/89	
		•	2) 00	378	900	Š	428	
Specific Conductivity		- 3		2 2	¥	2.5	20.5	
Temperature		* *	, 100 100 100 100 100 100 100 100 100 10	2 Y	2 2	8	7.45	
	E 130.	< c	ī	` \	S	87.2	85.6	
AIKALINITY - TOTAL			Ì	S 3	S	106.4	10.7	
	1 971	*	Ì	5	200	336	354	
TOTAL DISSOLVED SOLICE	F 325 4	; -	ì	250	250	65.9	71.6	
Chicaride	2767.2	9.50	ì	?	1.4	0.18	0.21	
Figoriae	5.74. A		Ì	, <u>F</u>	45	9.6	7.0	
MILTERS + MILLING	1 XX	-	Ì	220	250	65.0	43.2	
		2		S	SZ	20.3	20.2	
	01030	6	/4	(C)	SZ	9.86	87.6	
Magaza Lan	20010	0.0150	7	ş	8	0.0161	0.0240	
Michol.	510010	0,000	Ž	. 16	٧.	0.0449	2	
Dotate :	5116010	8	Ž	SE	SZ	- 8- -	 8.	
Coding	SU6010	8	Ž	SH	SH	51.7	62.7	
Toluene	\$10050	-	3	14,300	<u>\$</u>	~	2	
MOTES: Beaulta reported for detected	detected	enelytes only	only.		1 6 6 9 9 9	*		

MOTES: Results reported for detected analytes only.

MT: aralyte not tested

MD: aralyte not detected.

MD: aralyte not detected in limits for detected aralysis are given in Appendix A.

MD: aralyte not detected in blank

MD: detected in blank

MD: detected

MD

Table 4.1.18-4
RANGES OF CONTAMINANTS DETECTED AT SITE 18

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
SURFACE SOILS			••••••	
TFH-diesel	mg/kg	ND	39,000	27/36
TFH-gas	mg/kg	ND	7,800	21/36
chromium	mg/kg	20.2	372	36/36
nickel	mg/kg	6.9	1060	36/36
Lead	mg/kg	ND	348	11/36
zinc	mg/kg	18.0	316	36/36
2-butanone	mg/kg	ND	2.2	1/36
chlorobenzene	mg/kg	ND	11	2/36
ethylbenzene	mg/kg	ND	25	9/36
toluene	mg/kg	ND	28	20/36
xylenes (total)	mg/kg	ND	49	7/36
SOIL BORINGS				
TFH-diesel	mg/kg	ND	52,000	9/9
TFH-gas	mg/kg	NO	1,500	9/9
2-butanone	mg/kg	ND	1.1	4/9
carbon disulfide	mg/kg	ND	(2.2)	3/9
chloroform	mg/kg	ND	(0.022)	2/9
ethylbenzene	mg/kg	ND	67	2/9
toluene	mg/kg	ND	(0.65)	5/ 9
trichloroethene	mg/kg	ND	26	2/9
trans-1,2-dichloroethene	mg/kg	ND	12	1/9
4-methyl-2-pentanone	mg/kg	ND	21	2/9
xylenes (total)	mg/kg	NO	49	2/9
GROUNDWATER				
nickel	mg/l	ND	0.045	2/4
zinc	mg/L	ND	0.023	1/4
TFH-gas	mg/t	ND	0.80	2/4
toluene	ug/l	NO	12.0	3/4

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOG. $\,$

Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

- 4.1.18.2 Sampling and Analytical Problems
- 4.1.18.2.1 Loss of Samples

There were no sample loss problems for Site 18 samples. No samples needed to be resampled and all scheduled analyses were completed.

4.1.18.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 18 contained several organic compounds which were probably laboratory or field induced false positive results. Many of the soil samples collected contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks.

In the first semiannual samples, TFH-gas was detected in both Site 18 monitoring wells (less than 1 mg/l), and also in background well BG-C-2 (2 mg/l). These three samples were run on the same day in the laboratory. Based on this, and the lack of any subsequent TFH-gas detections in the August 1989 samples, the TFH-gas detected at Site 18 in first round sampling is suspect. Toluene was detected in the first semiannual sample round but was not confirmed in the second round which makes the first round results suspect.

Toluene was detected in many of the Site 18 soil samples at concentrations ranging from the detection limit to 28 mg/kg. Toluene was also detected in soil samples from throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is usually a false positive result. For soil replicate QC samples in which toluene was detected, duplication of the toluene result was not good, with the relative percent difference (RPD) ranging from 89 to 112 percent, or toluene was found in one of the samples and not the associated replicate sample. This is another indication that the toluene may not be a true contaminant present at the site. At Site 18 toluene was detected in some samples at higher concentrations than observed at other sites. For these samples, toluene probably is a true contaminant.

Four field replicate QC soil samples were collected at Site 18. The replicate for surface soil 18-C-10SS did not have good comparison to the original sample results. Metals results were comparable but TFH-diesel had an RPD of 48 percent and TFH-gas was detected in the original sample at 370 mg/kg but not detected in the replicate. Additionally, toluene and methylene chloride were both detected in one of the samples but not in the other.

The surface sample 18-C-20SS had better agreement between the sample and the replicate. Only toluene had a high RPD of 112 percent. Similarly, the surface sample 18-C-29SS and the associated replicate had generally good comparison with RPDs ranging from 26 percent for TFH-diesel to 59 percent for lead.

The replicate soil boring sample from 18-C-1SB, 11.5 to 13 feet, had little comparison to the original sample taken from 10 to 11.5 feet. Relatively high concentrations of TFH-diesel and -gas were detected in the replicate sample but not in the original sample. Some metals results had good agreement (copper concentrations equal in original and duplicate samples), while other metals had vastly different concentrations (manganese RPD = 197 percent). It is not known what caused these replicate disparities as the lith-ology and sample blow counts were similar.

4.1.18.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 18 samples.

4.1.18.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.18.3 Significance of Findings

Soil

TFH-diesel and gas were detected in each of the borings, at sample depths including the deepest, as illustrated on Figure 4.1.18-9. In 18-C-2SB, the TFH concentrations in the 10-foot sample (deepest), 12,000 mg/kg diesel and 1,200 mg/kg gas, were the highest in the boring.

Within the AVGAS area, samples were collected at the tank overflow discharge pipe, if present, at the bermed area surface drain, and in the drainage ditch outside the berms. Generally, TFH and volatile organic concentrations were greater in the sample collected near the overflow discharge pipe than at the surface drain inside the berm or the sediment sample from the ditch outside the berms, see Figures 4.1.18-5 and 4.1.18-6. This indicates that fuel which may have dripped from the overflow pipe on the AVGAS tanks generally remained in the soil, and was not significantly transported by surface water. However, based on Stage 2-1 information, the depth of TFH contamination within the AVGAS area has not been determined.

The distribution of TFH and volatile organics in the MOGAS area is similar to that in the AVGAS area. Although only one surface sample was collected in each berm area, the concentrations of TFH and volatile organics are greater here than in the samples collected from the ground surface east of the bermed MOGAS area. TFH-diesel and -gas were not detected in the three surface samples collected east of the bermed area.

Three surface samples were also collected from an unbermed area between the MOGAS unloading station and the railroad tracks. TFH-diesel in these samples ranged from 15 to 1,100 mg/kg; TFH-gas from non-detect to 300 mg/kg.

The LUFT cleanup standards calculated for soil samples at Site 18 are 10,000 mg/kg for TFH-diesel, and 1,000 for TFH-gas, except for the 11.5-13.0-foot field replicate sample in 18-C-1SB. Cleanup standards calculated for this sample are 1,000 and 100 mg/kg for TFH-diesel and -gas.

Four ICP metals were detected in surface soil samples from the AVGAS area at levels above the background range of two standard deviations above the mean average. Lead was detected in six surface samples collected within bermed areas in the AVGAS area (Figure 4.1.18-5). The lead concentrations ranged from 40.7 to 348 mg/kg. Lead was detected in two background soil boring samples collected at six other sites with an average concentration of 17 mg/kg. Chromium was detected in three surface samples at levels greater than two statistical standard deviations above the mean averaged value determined from background soil borings at other IRP sites at Beale AFB (Figure 4.1.18-7). These samples were each from the location within the bermed area below the overflow discharge pipe. Nickel and zinc were detected at similarly elevated concentrations in five and four samples

from the AVGAS area. Three of the nickel and two of the zinc samples coincided with the three samples containing high chromium levels. The highest concentration for each of these four metals was less than one half of the DHS TTLC for the respective metal. By the DHS TTLC criteria for lead, chromium, nickel, and zinc the sampled surface soil in the AVGAS area does not constitute a hazardous waste.

In the MOGAS area, lead was detected in four of the samples. Two of the samples were from the bermed tank area, and two from the MOGAS unloading area. The highest concentration was 237 mg/kg. The TTLC for lead is 1,000 mg/kg. Zinc was detected in two samples and the replicate of one of these samples at levels greater than two standard deviations above the mean average value for zinc from background soil borings on base. The highest zinc level, 316 mg/kg, was less than 10 percent of the DHS TTLC for zinc. By the DHS TTLC criteria, the soil sampled in the MOGAS area is not a hazardous waste.

The areas in which higher-than-average levels of these ICP metals occurred coincide with heavy use areas within the bulk fuel facility. Chemical analyses for specific fuels handled at Beale AFB were not available.

Several volatile organic compounds were detected in surface samples from the AVGAS and MOGAS areas (see Figure 4.1.18-5). The concentration pattern is similar to that of the TFHs and ICP metals discussed above. Volatile organic concentrations outside of the bermed areas are either suspected as false positive or were not detected. TTLC values are not available for the detected compounds.

Groundwater

Two groundwater monitoring wells were constructed and have been sampled semiannually during Stage 2-1 at Site 18. Well 18-C-1 is located near the AVGAS area and 18-C-2 is near the MOGAS area. In the first round of sampling, TFH-gas was detected in both groundwater samples at 0.80 and 0.70 mg/l, although these are believed to be false positive results. The BG-C-2 first quarter sample was laboratory tested on the same day as Site 18 samples, and had a similar TFH-gas detection. TFH-gas has not been confirmed in subsequent Site 18 or BG-C-2 well sampling.

No metals except manganese were detected at levels equalling or exceeding available DHS or EPA primary or secondary MCL values. The first round 18-C-1 sample manganese concentration was 0.053 mg/1, above the secondary MCL value of 0.05 mg/1. No other water quality parameters or analytes suggest any contamination of groundwater near Site 18 monitoring wells.

4.1.18.3.1 Zones of Contamination

The soil within the bermed tank areas is contaminated with fuel hydrocarbons and organic compounds. The soil in several of the bermed areas also contains higher than background averaged levels of lead, chromium, nickel, and zinc. Generally, contaminants in samples collected from outside the bermed areas were either not detected, or were at lower concentrations than those in samples from inside the bermed areas. This suggests that the lateral extent is limited to the bermed tank areas in the AVGAS area, and the bermed areas and tanker unloading facility in the MOGAS area. TFH and volatile organic compound contamination was detected in samples collected from the surface drainage ditches at Site 18. Since only surface samples were collected in these areas, the depth of soil contamination cannot be determined.

TFH-gas was detected in both monitoring wells at Site 18 in samples collected in the first semiannual sampling round, but not confirmed in the second (semiannual) sample. The first round detection is believed to be a false positive. Nickel and zinc were detected (one in each sample) in the initial round, and nickel only in the final round, at concentrations below 0.05 mg/l. Manganese was detected in all samples, with the first round 18-C-1 concentration exceeding 0.05 mg/l.

4.1.18.3.2 Contaminant Migration

Migration of contaminants detected in the surface soil and soil borings is likely to be downward, towards the ground-water. Based on the distribution of contamination in surface samples, migration by surface water is possible. Surface water from Site 18 drains to the south into Huchinson Creek.

If contaminants enter the groundwater at Site 18, they will migrate towards the west in the general groundwater flow direction.

4.1.18.3.2.1 Potential to Move Off Site and Off Base

Contamination detected in the soil may be moving towards the groundwater. Contaminants reaching the groundwater may move off the site.

As demonstrated by the decreasing concentrations away from the overflow discharge pipe samples the lateral migration of TFHs and organic compounds has been minimal. Infiltration through the vadose zone is essentially vertical, towards the groundwater table. Migration of the detected contaminants at Site 18 is expected to be vertical.

4.1.18.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Based on the 72-hour pump test of well 19-C-4, the average groundwater velocity in the vicinity of Site 18 is approximately 300 feet per year. From Figure 4.1.18-4, it can be seen that the direction of groundwater flow at Site 18 is to the west. Actual rates of migration for contaminants in groundwater would be affected by dispersion and retardation factors.

4.1.18.3.2.3 Time of Travel to Receptors

The nearest domestic or irrigation well to Site 18 is about 4,000 feet to the west. Groundwater moving about 300 feet per year will take about 13 years to travel this distance.

4.1.18.3.2.4 Applicability of Solute Transport Models

Solute transport models may not be applicable at Site 18 because of the lack of well-defined physical parameters such programs require for accurate modeling.

4.1.18.3.2.5 Expected Spatial and Temporal Variations in Concentration

The TFH-gas detected in both Site 18 wells during the first semiannual sampling round was not detected in the second semiannual sampling and is believed to be a false positive. No confirmed spatial or temporal variations of concentrations in groundwater have been observed.

4.1.18.3.3 Baseline Risk Assessment

No risk assessment activities were performed as part Stage 2-1.

4.1.19 DISCUSSION OF RESULTS FOR SITE 19: PHOTO WASTE EMERGENCY HOLDING BASIN

The photo waste emergency holding basin (EHB) was used intermittently to contain photographic laboratory discharges that were diverted from a concrete wet well during overflow conditions. The concrete wet well is used to hold laboratory discharges prior to piping to the photo wastewater treatment plant (Site 2). The EHB has a compacted clay bottom, concrete sides, and is fenced.

This site has not been previously included in the base IRP studies. The RWQCB conducted limited soil sampling of the EHB in April 1987 in which one sample had 1,300 mg/kg PCP, compared to the TTLC of 17 mg/kg. On the basis of this result, the RWQCB considers the site subject to provisions of the Toxic Pits Cleanup Act (RWQCB, 1987b. Soil, surface water, and groundwater sampling and analysis were conducted in Stage 2-1.

Wastewater discharge from the photo lab is the contaminant source at Site 19. The photo lab discharged into the basin only when the pipeline to the photo wastewater treatment plant (Site 2) could not carry all of the discharge or because of pump failure. Waste types included photo processing wastes containing metals. Prior to 1986, PCP was metered into the wastewater as an anti-slime agent. Residual PCP in the basin soils was sampled and reported at hazardous levels by the RWQCB in 1987.

4.1.19.1 Presentation of Results

The following section presents the results of the field investigation at Site 19. The discussion focuses on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on samples of soils, surface water, and groundwater.

4.1.19.1.1 Site Geology

Evaluation of local geology at Site 19 is based on drilling activities completed during Stage 2-1. Four wells at Site 19 were drilled during Stage 2-1. Three of these were designed as monitoring wells and are screened across the uppermost permeable zone encountered during drilling (see Figure 4.1.19-1 for locations). One pumping well (well 19-C-4) was installed south of the EHB to facilitate a long-term aquifer test. This well was drilled to a total depth of 145 feet (-36 feet NGVD), and screened over a 60-foot

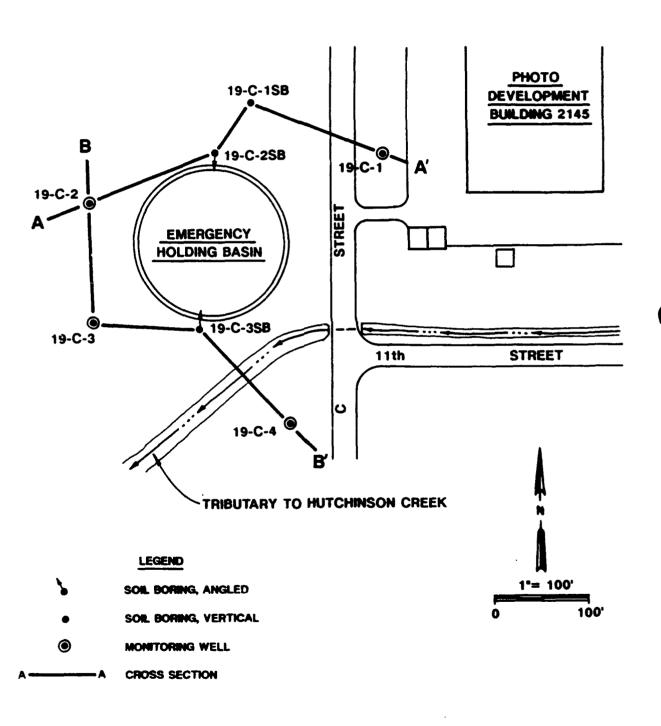


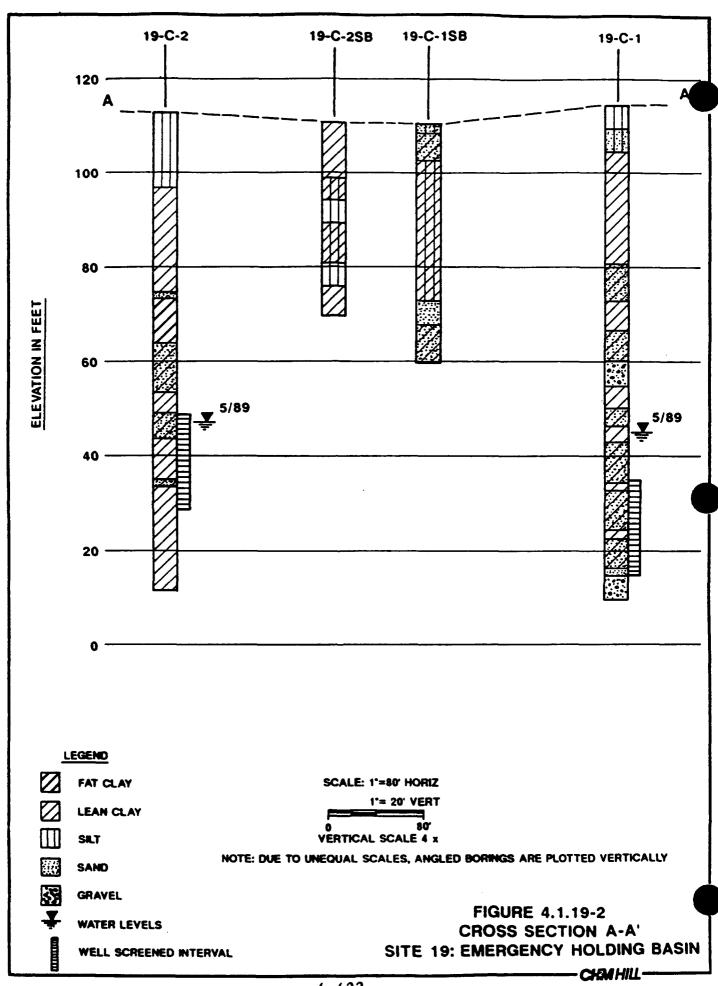
FIGURE 4.1.19-1
LOCATION OF GEOLOGIC CROSS SECTIONS
SITE 19: EMERGENCY HOLDING BASIN

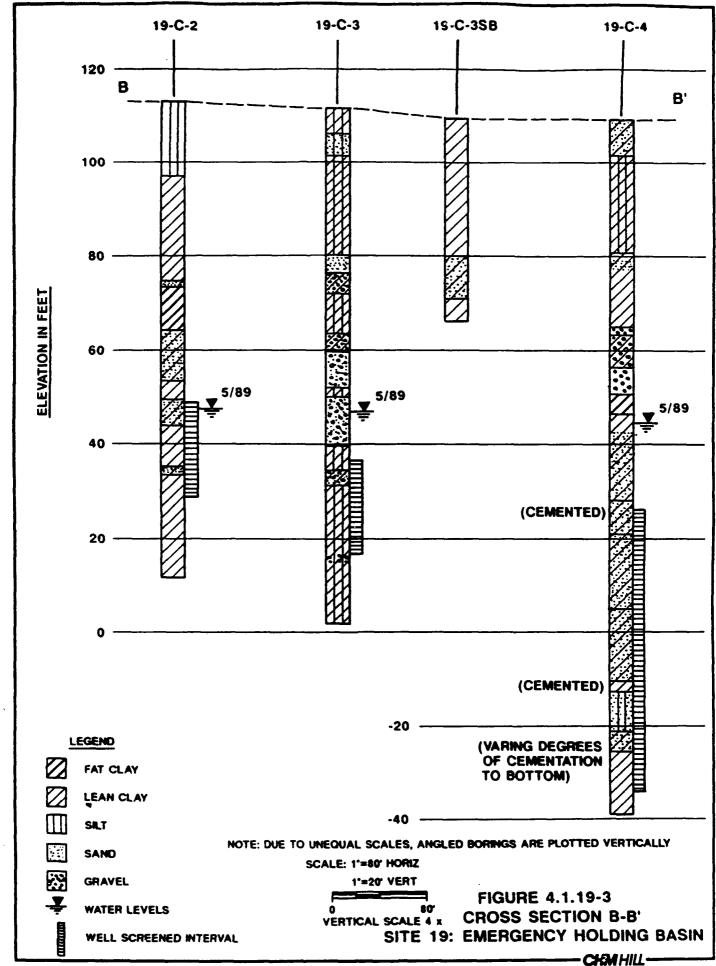
interval across the uppermost permeable zone. In addition, two angled boreholes were drilled and logged along the north and south perimeter of the EHB to a total depth of 50 feet (43 feet beneath the surface of the basin). Finally, a vertical background boring was drilled north of the EHB to a total depth of 51.5 feet. The location of all wells and boreholes is shown in Figure 4.1.19-1. Soil boring logs are provided in Appendix D.

Geologic cross-sections drawn through sediments encountered in the Site 19 boreholes and wells are located in Figure 4.1.19-1 and shown in Figures 4.1.19-2 and 4.1.19-3. These figures illustrate that the soil beneath the EHB is composed of an alluvial sequence of primarily fine-grained materials, with discontinuous zones of coarse-grained materials. As is typical of near-surface alluvium deposited in the Central Valley at the base of the Sierra Nevada foothills, individual beds in the soil profile at Site 19 may generally not be correlated among drilling locations.

Geologic cross-sections demonstrate that the EHB is almost entirely underlain by over 20 feet of clay (see Figures 4.1.19-2 and 4.1.19-3). Boring 19-C-2SB contains minor interbeds of silt and sand below a depth of about 13 feet (98 feet NVGD). Boring 19-C-3SB encountered clay throughout its entire length to a depth of 43 feet (67 feet NGVD) beneath the basin. Background boring 19-C-1SB and the well boreholes all encountered predominantly fine-grained and low-permeability materials to their total depths.

Surface soils at Site 19 have been mapped as being Redding-Corning gravelly loam, a medium-textured soil formed in alluvium from mixed sources (SCS, 1985). The surface geology at Site 19 was mapped by Page (1980) as lying on the contact between river deposits of Holocene Age and the Victor Formation of Pleistocene Age. Both of these units contain highly variable fine- to coarse-grained alluvium. Soil boring logs note the presence of cemented sediments at various depths, which are typical of both the Victor Formation and the Laguna Formation which lies under the Victor Formation in the stratigraphic section. Logs also note the presence of volcanic materials at depth in wells 19-C-1 and 19-C-4. These materials, together with layers of cemented sands and silts, imply that the boreholes contacted the volcanic rocks from the Sierra Nevada. This formation lies under the Laguna Formation in the stratigraphic section at Beale AFB.



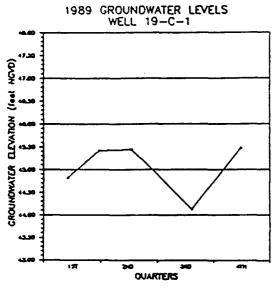


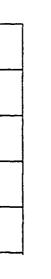
4.1.19.1.2 Site Hydrogeology

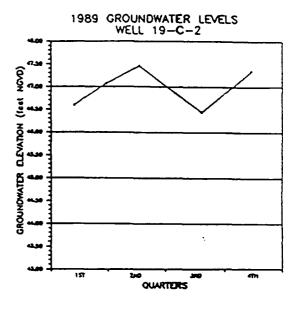
Groundwater flows preferentially through subsurface zones of greater permeability. Because of the predominance of lower permeability fine-grained materials beneath the EHB, the groundwater within the perimeter zones may be partially confined. The confining units are discontinuous, however, so the degree of confinement varies from well to well. Borehole 19-C-1, for example, first encountered a permeable zone that yielded water to the hole at a depth of 97 feet below the ground surface (18 feet NGVD). Overnight, however, water rose to a depth of about 70 feet BGS (45 feet NGVD). Well 19-C-2, on the other hand, first encountered water at a depth of 69 feet BGS (44 feet NGVD). Overnight, water rose to about 67 feet BGS (46 feet NGVD). In hydrogeologic settings such as this, the degree of confinement also typically increases with depth (Page, 1980).

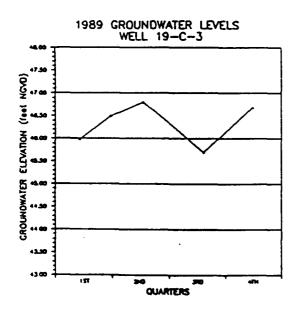
Table 4.1.19-1 and Figure 4.1.19-4 show the variation in water levels in the monitoring wells at the EHB during 1989. A complete summary of groundwater level data, including elevations and depths to water, is provided in Appendix G. Water levels in these wells varied only about 1 foot during this time. The variation seemed to follow a seasonal pattern, rising during the spring, falling during the summer, and rising during the fall. Rowever, the magnitude of the fluctuations was too low to allow definite conclusions. This lack of change was typical of wells constructed on the eastern side of Beale AFB.

	GR	OUNDWATER E	e 4.1.19-1 LEVATIONS: LET NGVD)	SITE 19		
Well_	Screened Interval	Jan. 1989	March 1989	<u>May</u> 1989	Aug. 1989	Nov. 1989
19-C-1	35 to 15	44.43	45.41	45.44	44.12	45.47
19-C-2	48 to 28	46.46	47.07	47.46	46.44	47.35
19-C-3	37 to 17	45.75	46.49	46.80	45.70	46.68
19-C-4	34 to -26		44.76	44.65	43.26	44.67









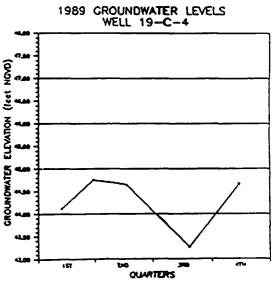


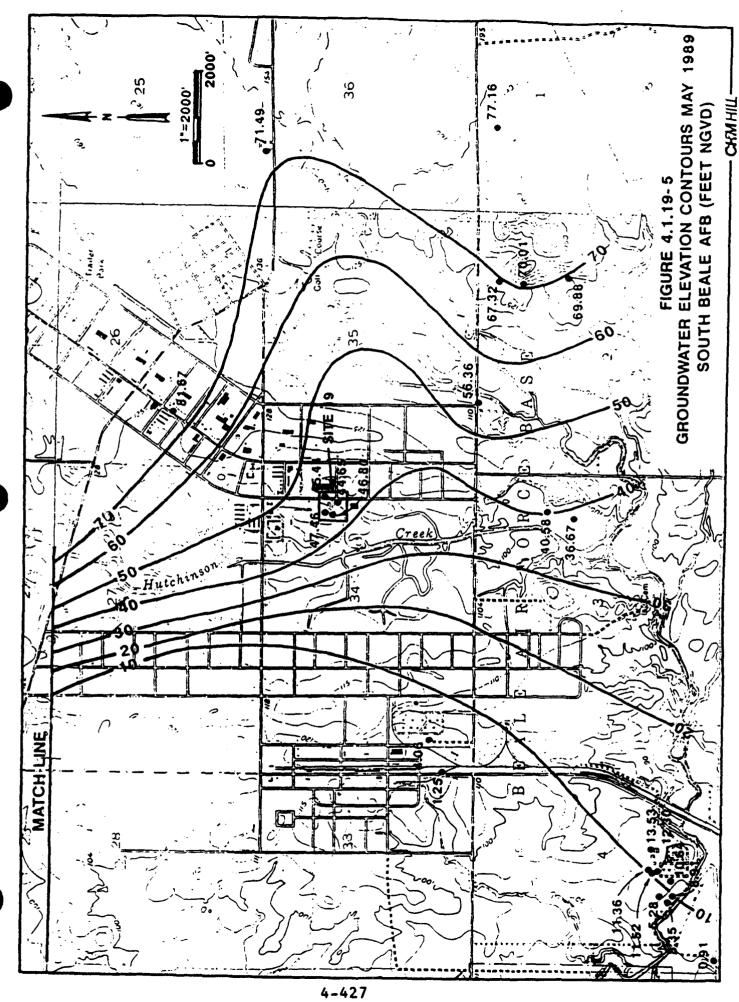
FIGURE 4.1.19-4
MONITORING WELL HYDROGRAPHS
SITE 19: EMERGENCY HOLDING BASIN

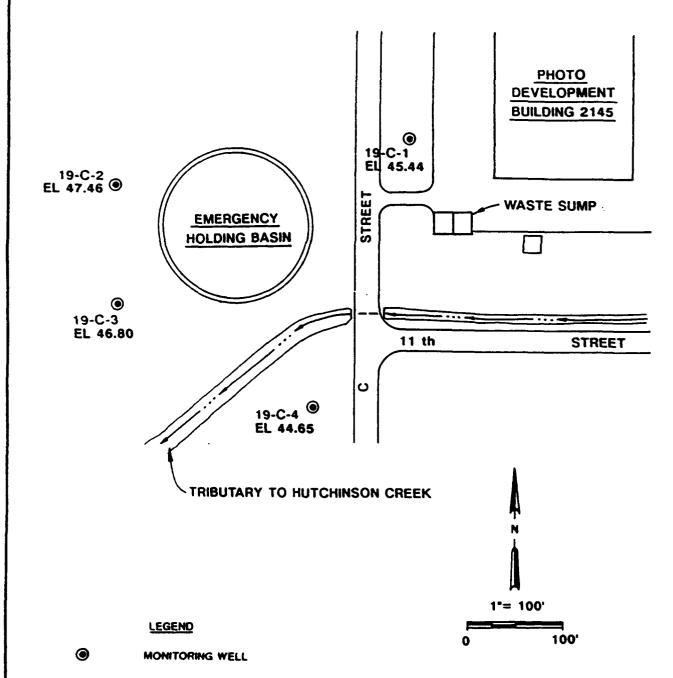
-CHEMIHILL-

Figure 4.1.19-5 plots groundwater elevation contours in the south portion of Beale AFB based on water level measurements taken in May 1989. Plate 3 plots groundwater level contours based on elevations measured in March 1989 over the base as a whole. Plate 4 plots contours based on November 1989 data. The presence of the groundwater depression west of the base is implied in this figure and these plates, which show that the depression controls flow directions in the western part of the base. A groundwater trough is visible to the east of the cantonment area. This trough may be caused by materials with relatively higher permeability in this area, perhaps due to the presence of buried stream channel alluvium. Flow directions shown in Figure 4.1.19-5 and Plates 3 and 4 are generally from east to west on base, with local variation occurring because of the regional groundwater depression and groundwater trough. The horizontal gradient in the vicinity of the EHB is about 10 feet per 1.600 feet, or 0.006.

Figure 4.1.19-6 shows groundwater elevations at Site 19 based on data collected in May 1989. Groundwater contours cannot be drawn with certainty from these data because the wells are screened at different depth intervals. The monitoring wells at the EHB are listed in order of decreasing elevation of screened interval as follows: 19-C-2 (28-48 feet NGVD), 19-C-3 (17-37 feet NGVD), 19-C-1 (15-35 feet NGVD), and 19-C-4 (-26 to 34 feet NGVD). This order correlates with the order of decreasing groundwater elevations in Figure 4.1.19-6. Table 4.1.19-1 indicates that the order of decreasing groundwater elevations was the same for all measurements taken during 1989. The data may imply the existence of a vertical groundwater gradient downward at the EHB. This downward flow may reflect groundwater recharge induced by the depression west of the base. Alternatively, there may be a horizontal gradient of flow to the southeast beneath the EHB, induced by the trough shown on Plates 3 and 4 and Figure 4.1.19-5. The data are inconclusive.

A long-term multiple well pump test conducted at the EHB consisted of 72 hours of drawdown followed by 72 hours of recovery. Well 19-C-4 was the pumping well, and 19-C-1, 19-C-2, and 19-C-3 were observation wells. Water levels in 19-C-1 were measured with a calibrated electric sounder. Water levels in the other wells were monitored automatically with In-situ Hermit dataloggers and pressure transducers. Data were transferred directly to a portable computer in the field. Water levels were measured during the test in well 6-C-1 to allow comparison to background water level changes in a well unaffected by the pump test. In addition, water





NOTE: CONTOURS ARE NOT DRAWN ON THE GROUNDWATER LEVELS BECAUSE WELL SCREENS ARE NOT ALL LOCATED IN THE SAME PERMEABLE ZONE.

FIGURE 4.1.19-6
GROUNDWATER ELEVATION MAY 1989
SITE 19: EMERGENCY HOLDING BASIN

levels in wells 6-C-1, 19-C-2, and 19-C-3 were also monitored over a 5-day period after the test. These data were then compared with barometric pressure data collected hourly at the Beale AFB weather station, allowing pump test data to be corrected for barometric pressure changes. Plots showing barometric pressure and groundwater fluctuations are contained in Appendix E.

Short-term (3 to 8 hours) pump tests were also conducted in wells 19-C-1, 19-C-2, and 19-C-3. In each test, water levels were measured with data loggers and pressure transducers. Drawdown and recovery data from all of the pump tests were analyzed using the semilog plot method (Cooper and Jacob, 1946). A summary of the results of the analyses is presented in Table 4.1.19-2. A more complete discussion of aquifer testing methodology, as well as drawdown and recovery plots, is included in Appendix E.

Values of transmissivity and hydraulic conductivity obtained from plots on data collected in observation wells during the 72-hour test should be viewed with caution. The investigation at the EHB revealed a high level of stratification in subsurface geologic materials. Permeable zones are interbedded with materials of lesser permeability, which results in a lower hydraulic conductivity in the vertical direction than in the horizontal direction. The observation wells are screened in the upper portion of the aquifer and only partially penetrate the zone screened by the pumping well. Drawdown in these wells, particularly wells 19-C-2 and 19-C-3, may have been reduced because of the lower vertical permeability. If so, this would artificially elevate the values of transmissivity and hydraulic conductivity derived from these wells.

Values of transmissivity and hydraulic conductivity obtained from short-term tests should be regarded as representative of the hydrogeology in the immediate vicinity of the well-screens. Results obtained from pumping well 19-C-4 during the 72-hour test may be viewed as good representative values for the upper portion of the aquifer. The average transmissivity was 1,700 square feet per day, while the average hydraulic conductivity was 28 feet per day (9.9 x 10⁻³ cm/sec).

The average linear velocity of groundwater flow may be estimated by substitution into Darcy's Law. Using the average hydraulic conductivity derived from the pumping well during the 72-hour pump test of 28 feet per day, the measured hydraulic gradient of 0.006, and an estimated effective

Table 4.1.19-2

RESULTS OF AQUIFER TESTING AT THE EMERGENCY BOLDING BASIN

(Cooper-Jacob Method)

Hydraulic Drawdown (D) Transmissivity Conductivity Pumping (P) or T ĸ Storativity (ft^2/d) Well Observation (O) Date Recovery (R) (ft/d)19-C-4 P . 3/16-19/89 1,300 22 19-C-4 P 3/19-22/89 2,000 19-C-1ª 0 3/16-19/89 4,000 67 19-C-1ª 0 3/19-22/89 4,000 67 7.4×10^{-3} 19-C-2ª 0 3/16-19/89 3,400 56 19-C-2ª 3/19-22/89 3,000 50 19-C-3ª 3/16-19/89 8.3×10^{-3} D 3,100 52 19-C-3ª 3/19-22/89 2,500 42 19-C-1 2/22/89 D 1,100 55 19-C-1 2/22/89 735 37 19-C-2 2/27/89 100 5.3 19-C-2 2/27/89 4.3 81 19-C-3 4.8×10^{-4} 2/27/89 18 370 19-C-3 3/1/89 10 200 19-C-3 3/1/89 190 9.7 3.5×10^{-4} 19-C-2 3/1/89 10 D 190

^aTransmissivity and hydraulic conductivity values may be elevated (see text).

transport porosity in the permeable materials of 0.20, the approximate velocity of groundwater movement beneath the EHB is about 0.84 feet per day, or 310 feet per year.

4.1.19.1.3 Analytical Results

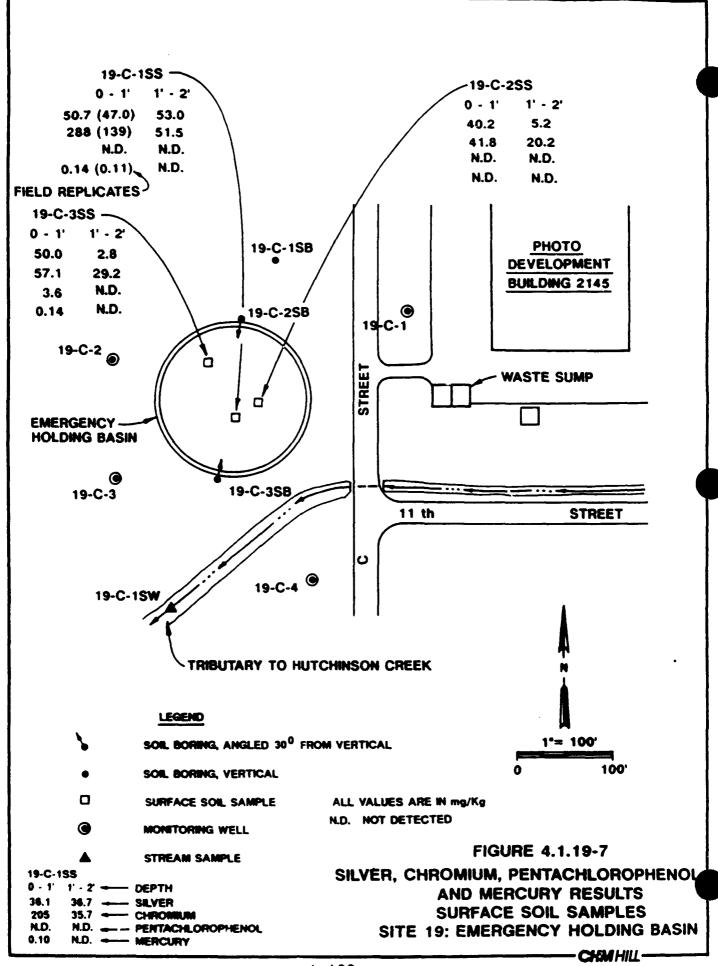
The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results table in Section 4.1.19.1.4 and in Appendix A.

Surface Soils

Six soil samples were taken at Site 19 from three locations within the emergency holding basin with two samples at each location: one from zero to 1 foot and another from 1 to 2 feet. These samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), and TFH-diesel and -gas (California method). The upper basin soil sample at 19-C-2SS from the ERB was also analyzed for dioxins and furans.

Toluene was detected above the LOQ in three of six samples from the basin at up to 0.055 mg/kg. In the zero- to 1-foot sample at 19-C-1SS bis(2-ethylhexyl) phthalate was detected at 1.4 mg/kg (1.4 mg/kg in field replicate) and fluoranthene at 0.83 mg/kg (0.65 mg/kg in field replicate). In the 1- to 2-foot sample, di-n-butyl phthalate was detected at 0.72 mg/kg. Xylenes (0.53 mg/kg) and several semivolatile compounds were detected in the zero- to 1-foot sample at 19-C-3SS including PCP (3.6 mg/kg), fluoranthene (8.8 mg/kg) 2 methylnaphthalene (11 mg/kg), and naphthalene (1.6 mg/kg).

Silver, potassium, sodium, and mercury were detected in the basin samples at levels more than two standard deviations above background levels at Beale with the zero- to 1-foot samples having generally higher concentrations than the 1-to 2-foot samples (Figure 4.1.19-7). Silver was detected in the six EHB samples at 2.8 to 53.0 mg/kg. Potassium ranged from 224 to 1,690 mg/kg. Sodium ranged from 150 to 1,120 mg/kg. Mercury was detected in the 0 to 1 foot samples at 19-C-1SS at 0.14 mg/kg (0.11 mg/kg in field replicate) and



at 19-C-3SS at 0.14 mg/kg. TFH-diesel (340 mg/kg) and -gas (280 mg/kg) were detected in the upper samples at 19-C-1SS (650 and 210 mg/kg in field replicate) and 19-C-3SS (3,800 and 720 mg/kg) and the lower sample at 19-C-3SS at 290 and 70 mg/kg.

The zero- to 1-foot sample at 19-C-2SS was analyzed for dioxins and furans. Tetra dioxins were 0.00003 mg/kg (0.03 ug/kg), penta dioxins 0.0001 mg/kg (0.1 ug/kg), hexa dioxins 0.0028 mg/kg (2.8 ug/kg), hepta dioxins 0.188 mg/kg (18.8 ug/kg), and octa dioxins 0.069 mg/kg (69 ug/kg). Tetra furans were 0.0001 mg/kg (0.1 ug/kg), penta furans 0.0003 mg/kg (0.3 ug/kg), hexa furans 0.0017 mg/kg (1.7 ug/kg), hepta furans 0.0091 mg/kg (9.1 ug/kg), and octa furans 0.023 mg/kg (23 ug/kg).

Soil Borings

A total of 15 soil boring samples were collected at Site 19: five from each of the two angle borings under the EHB and five samples from the vertical background boring north of the basin. These samples were analyzed for the same analytes as the basin soil samples, except that no dioxin/furan analyses were conducted.

The only volatile organic compounds detected in Site 19 soil borings were toluene, which was detected in 11 samples up to 0.044 mg/kg, trans-1,2-DCE, which was detected at 0.008 mg/kg in the 49-foot sample at 19-C-3SB, and benzene, which was detected at 0.007 mg/kg in the 8-foot sample in boring 19-C-2SB. Semivolatile organic chemicals were estimated in several soil boring samples at Site 19 at levels near the LOQ. Bis(2- ethylhexyl) phthalate was estimated in three samples below the LOQ. Di-n-butyl phthalate was detected in three samples up to 0.48 mg/kg; 2-butanone was estimated below the LOQ in Three samples.

ICP metals were detected in Site 19 soil boring samples at concentrations generally similar to background levels. Mercury was detected in all samples from soil boring 19-C-2SB at 0.074 to 0.090 mg/kg. TFH-diesel and -gas were not detected in soil borings at Sine 19.

Surface Water and Groundwater

During the IRP Stage 2-1 investigation, surface water samples were collected on a quarterly basis from the small drainage ditch that is a tributary to Hutchinson Creek just downstream from the EHB. The sample location is shown in

Figure 4.1.19-7. The results of the analyses are included in Appendix A, while Table 4.1.19-3 summarizes results for purgeable aromatics and purgeable halocarbons (EPA 8010 and 8020 compounds), semivolatile organics (EPA 8270 compounds), ICP metals, TFH (diesel and gasoline), arsenic, lead, mercury, selenium, TDS, major anions, nitrates, and chemical oxygen demand. A complete list of these compounds may be found in Appendix A.

Arsenic was detected only in the first quarter surface water sample at 0.015 mg/l. Chromium was detected in the second quarter sample at 0.107 mg/l and in the fourth quarter at 0.137 mg/1. Iron was detected in the first quarter at 0.307mg/1, in the second at 0.168 mg/1, in the third at 0.149 mg/1, and in the fourth at 4.67 mg/1. Barium was detected at 0.130 mg/l and fluoride at 0.46 mg/l, only in the second round. Manganese was below the 0.015 mg/l LOQ in the first quarter, 0.119 mg/1 in the second quarter, 0.043 mg/1 in the third quarter, and 1.22 mg/l in the fourth. The following metals were detected only in the fourth quarter sample: aluminum at 3.00 mg/l, cadmium at 0.0369 mg/l, cobalt at 0.0552 mg/1, copper at 1.68 mg/1, and nickel at 0.0631 mg/1. This sample had a low field pH of only 4.15 which may account for some of the elevated metals concentrations.

Nitrate was detected in all rounds at 1.3 to 2.2 mg/l. Chemical oxygen demand varied from 25.4 in the first round to 137 mg/l in the second, 24.1 mg/l in the third, and 77.9 mg/l in the fourth. TDS followed a similar pattern going from 106 mg/l in the first round to 654 mg/l in the second, 52.0 mg/l in the third, and 445 mg/l in the fourth. TFH-gas was detected in the first round sample at 0.20 mg/l but not in later samples. TFH-diesel was only detected in the fourth round at 0.16 mg/l.

No volatile organic chemicals were detected and confirmed in the first, third, and fourth round surface water samples. Semivolatile components were not detected in the first or fourth rounds and in the third round N-Nitrosodiphenylamine and bis(2-ethylhexyl) phthalate were detected below the LOQ.

In the second quarter surface water sample, toluene was detected at 1 and 2 ug/l in the normal and replicate samples, at or near the detection limit of 1 ug/l. Toluene was not confirmed in the second column for the normal sample, but was confirmed for the replicate. Ethylbenzene was detected at 2 ug/l in both the normal and replicate samples, slightly above the detection limit of 1 ug/l. However, no ethylbenzene was detected in second-column confirmations for

these samples. Total xylenes were found at 5 ug/l in both second quarter samples, again with no second-column confirmation. Phenol, 2-methylphenol, and phenanthrene were found slightly above detection limits in the second quarter replicate sample, but not in the regular sample. 4-Methylphenol, benzoic acid, napthaline were detected below the LOQ in the replicate sample but not the original. Pyrene, benzo(a) anthracene, chrysene and bis(2-ethylhexyl) phthalate were detected below the LOQ in both the normal and the replicate samples. No semivolatile compounds were detected in the equipment wash blank.

Trichloroethene was detected in the fourth quarter surface water sample at 30 ug/l in the first column but this was not confirmed in the second column conformation or in a third column run to attempt to confirm the first column results. Therefore, TCE is considered to not be present in the sample. Aside from major cations and anions, no other compounds were detected in surface water samples.

Monitoring wells at Site 19 were sampled on a quarterly basis during 1989. The location of these wells is shown on Figure 4.1.19-7. During the first quarter, only monitoring wells 19-C-1, 19-C-2, and 19-C-3 were sampled. After it was determined that well 19-C-4 may be downgradient of the EHB, this well was also sampled during subsequent sampling episodes. Analyses included purgeable halocarbons and aromatics (EPA 8010 and 8020 compounds), semivolatile organics (EPA 8270 compounds), ICP metals, TFH (gasoline and diesel), arsenic, lead, mercury, selenium, major ions, nitrates, chemical oxygen demand, TDS, electrical conductivity, alkalinity, temperature, and pH. Results of analyses of samples collected from wells at the EHB are attached in Appendix A.

Table 4.1.19-3 summarizes the parameters detected in each well during the four quarterly sampling episodes. COD was 20.6 mg/l in the first round sample from 19-C-l and 24.0 mg/l in the second sample from 19-C-2 and was below the 7.0 mg/l detection limit in all other groundwater samples. The nitrate levels in all the samples ranged from 12.5 to 27.8 mg/l. The nitrates may originate at the golf course, which is irrigated with reclaimed wastewater and is located about 1 mile upgradient from the EHB. In well 19-C-1, chloride was detected at 81.8 mg/l in the first round, but dropped to 26.8 mg/l in the second round, 30.8 mg/l in the third round, and 28.8 mg/l in the fourth. No dominant cation could be identified from the samples. Among the anions, bicarbonate exceeded sulfate and chloride.

Manganese was 0.058 mg/l in the second round sample and 0.388 mg/l in the fourth round sample from 19-C-1. Lead was detected in the first quarter sample from well 19-C-2 at 0.017 mg/l. Several metals were detected which had not been previously: aluminum at 7.23 mg/l, barium at 0.131 mg/l, and iron at 11.2 mg/l. Potassium and zinc, which were detected in the first quarter, were 1.22 and 0.021 mg/l, respectively.

No purgeable halocarbons or aromatics or semivolatile organic compounds were detected in the first quarter samples. TFH-gasoline was not detected in any sample round and TFH-diesel was not detected in the first three sample rounds. The second and third quarter samples from wells 19-C-1 and 19-C-4 both contained TCE from 2 to 3 ug/l (all confirmed in second column). The second quarter sample from well 19-C-4 also contained 1 ug/l of carbon tetrachloride (2 ug/l in second column).

In the fourth quarter, TCE was detected at 19-C-1 at 4 ug/1 (4 ug/1 in the second column) and 19-C-4 at 2 ug/1 (3 ug/1 in the second column). TFH-diesel was detected at 0.070 mg/1 in 19-C-1, 0.050 mg/1 in 19-C-2, 0.070 mg/1 in 19-C-3, and 0.060 mg/1 in 19-C-4. Diethylphthalate, N-Nitrosodiphenylamine and Di-n-Butylphthalate were detected below the LOQ in 19-C-1. Bis(2-ethylhexy1)Phthalate was detected below the LOQ in 19-C-2. N-Nitrosodiphenylamine was detected at the 10 ug/1 LOQ in 19-C-4.

Toluene was detected in the second quarter sample from well 19-C-1, and the second and third quarter samples from wells 19-C-2 and 19-C-3. However, three of these samples failed to show toluene in second column confirmations. In addition, the second quarter sample from 19-C-3 detected toluene in the field replicate sample, and not in the regular sample. Furthermore, toluene was detected in the equipment wash blank and field blank samples accompanying the replicate. Toluene was not detected in the fourth quarter samples.

4.1.19.1.4 Analytical Results Table

Table 4.1.19-3 presents a summary of all detected analytes for Site 19. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.19-3 are generally the lowest federal and state levels applicable to the sampled media

TABLE 4.1.19-3

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 19

				Standards, and Action	Criteria Levels (a)	19-C-15S	19-C-15S ⁶ BAFB-0080	19-C-1SS BAFB-0081	19-C-2SS BAFB-0144	19-C-2SS BAFB-0181	19-C-3SS BAFB-0182
Parameter	Method	Limit	Uni ts	Federal	State	11/23/88	11/23/88	11/23/88	12/02/88	12/02/88	12/02/86
Percent Moisture	ASAJO	V/R	**	SI	SZ	28.8	28.7	30.7	25.6	10.7	**
Mercury	17.47LR	0.00	mg/kg	SN	2	0.14	0.11	₽	9	2	0.14
TFH-Diesel	TFH-DI	1.0	mo/kg	SE	SE	340	929	2	욡	2	3800
TFH-Gas	TFH-GA	2	mo/kg	SE	SH	580	210	2	욮	윺	22
Atumina	Sta6010	20.0	mo/ko	SE	SH	17800	20200	16200	14500	2510	20100
Berice	Stu6010	10.0	mo/kg	SR	10,000	243	272	235	222	¥.6	230
Beryllium	State 010	0.20	MQ/kg	SE	ĸ	9	2	9	€	¥	0.53
Colcius	Sta6010	5	mo/kg	SE	SE	2960	3280	3190	2960	645	3390
Chromium	SN6010	3.0	mo/kg	SI	200	288	139	51.5	41.8	20.5	57.1
Cobelt	SW6010	0.4	mg/kg	SE	8,000	7.6	8.1	8.7	11.0	1.7	13.2
Copper	SW6010	3.0	MQ/kg	SZ	2,500	26.7	4.4	30.2	28.9	7.8	37.9
Te.	SW6010	10.0	Mo/kg	N	SE	24300	28500	22800	21600	5350	27200
Magnes i un	SW6010	5	mg/kg	SR	SZ	0767	5330	4170	0294	965	2390
Hanganese	SW6010	1.5	mo/kg	S¥	SH	171	185	2	277	24.4	36
Nickel	S46010	4.0	MQ/kg	SM	2,000	23.9	28.2	23.1	25.5	12.3	28.3
Potassium	SW6010	200	MO/kg	SH	SH	1690	1680	952	1300	554	1300
Silver	Sw6010	3.0	MQ/kg	SN	200	50.7	47.0	53.0	40.2	5.5	20.0
Sodium	SW6010	5	MQ/kg	SM	SE	538	558	395	8 01	150	1120
Vanadium	S46010	4.0	10/kg	SE	2,400	1.44	53.0	45.0	44.1	11.2	55.8
zinc	SW6010	2.0	Mo/kg	SH	2,000	48.3 8	52.7	B 41.6	8 45.2	8.8	50.3
Methylene Chloride	SHB240	0.005	mo/kg	SH	SE	0.014 8	0.008	0.000	8 0.013	B 0.004	BJ 0.10 EJ
Acetone	SH8240	0.010	MO/kg	SE	SE	≘	2	2	0.037	B 0.026	9
4-Hethyl-2-Pentanone	SMB240	0.010	MO/kg	SE	SE	₽	2	2	0.00	J 0.004	2
Toluene	SHB240	0.002	Mo/kg	SH	SE	0.045	0.055	0.010	0.005	2	욮
Ethylbenzene	SMB240	0.00	MO/kg	SZ	SE	2	2	2	£	2	0.17 J
Xylenes (ovm)	SHB240	0.005	MQ/Kg	S#	SE	2	2	₽	윺	9	0.53
Xylenes (total)	SM8240	0.00	mg/kg	SH	SX	윺	£	2	2	2	0.53
Phenol	SM8270	0.33	mg/kg	SE	SH	1.7 8	1.3	8 2.5 1	9	2	2
1,3-Dichlorobenzene	SH6270	0.33	mg/kg	SN	SN	2	욮	윺	Q	2	0.22 J
WOTES: Results reported for detected analyt	for detected	: 2	only.								
MI: analyte not tested					Malyte oete	analyte detected in blank	¥		e: edu	equipment wash blank	

W: analyte not detected.

R: resample

N: values listed in () are 2nd column confirmation values.

S: values represent most stringent standard, criteria or action level. See Appendix I.

S: Values represent most stringent standard, criteria or action level. See Appendix I.

The faderal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

* The faderal standard for nitrate.

* The faderal standard for Nitrate.

* The faderal standard for Nitrate is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.19-3 (continued)

Detec Perameter Method Lim	Method	Detection Limit	Units	Standards, Criteria and Action Levels (Standards, Criteria and Action Levels (a) Federal State	19-C-1SS BAFB-0079 0.0-1.0 ¹	19-C-1SS ^f BAFB-0060 0.0-1.0 ⁴ 11/23/88	19-C-1SS BAFB-0081 1.0-2.01	19-C-2SS BAFB-0144 0.0-1.01 12/02/88	19-C-2SS BAFB-0181 1.0-2.0' 12/02/88	19-C-3SS BAFB-0182 0.0-1.0 ¹ 12/02/88
1.4-Dichlorobenzene	SW8270	0.33	ma/ka	Ş	SE	9	2	2	9	9	0.3k
1.2-Dichlorobenzene	S46270	0.33	mo/kg	SE	SE	2	9	2	₽	2	0.20
Maphthalene	SUB 270	0.33	MQ/kg	SZ	SI	9	2	₽	2	₽	1.6
2-Nethylnaphthalene	S46 270	0.33	mo/kg	S	S	욡	9	皇	₽	윺	=
Pentachlorophenol	SUB 270	1.6	Mo/kg	SZ	11	2	9	9	2	2	3.6
Anthracene	SMB27 0	0.33	mo/kg	SZ.	SE	웆	2	9	2	2	0.26
9 i -n-butylphthelete	SMB 270	0.33	Mo/kg	SE	SH	0.34	0.24	J 0.72	0.42	8.	1.3 (
fluoranthene	SMB 270	0.33	MO/kg	S¥	SH	0.83	0.65	2	욮	₽	8.8
Pyrene	SM6270	0.33	mo/kg	S	SE	2	욮	2	2	욡	0.24
Butylbenzylphthalate	SUB270	0.33	Mo/kg	SH	SE	윺	2	2	2	2	
bis(2-ethylhexyl)phthalate	SM6270	0.33	To/kg	SE	SH	7.6	1.4	2	2	2	9
Tetra Furama (total)	SMB280	0.00001	Mo/kg	S#	SE	F#	Ħ	Ħ	0.0001		Ħ
Penta Furama (total)	SMB280	0.00001	mo/kg	SZ	SH	Ħ	Ħ	-	0.0003	Ħ	H
Mexa Furans (total)	SMB280	0.00001	mo/kg	S#	SE	=		=	0.001	Ħ	
Wepta Furans (total)	SMB280	0.00001	Z/kg	¥	SH	×	×	#	0.00	H	H
Octa Furans (total)	SIMB280	0.00001	mo/kg	SH	SE	H	H		0.023	I	
Tetra Dioxins (total)	SMB280	0.00001	Mo/kg	SE	<u>.</u>	H			0.00003	Ħ	=
Penta Dioxins (total)	Sub280	0.00001	MQ/kg	SE	SZ		=	Ħ	0.0000	Ħ	=
Hexa Dioxins (total)	SMB280	0.00001	MO/Kg	SH	SE	H	Ħ	Ħ	0.003	Ħ	H
Mepta Dioxine (total)	Su6280	0.00001	mo/kg	S¥	SX	=	H	Ħ	0.019	Ħ	H
Octa Dioxine (total)	SMB280	0.00001	MQ/kg	SE	S	H		Ħ	0.069	X	H
MOTES. Besuits reported for detected and the	detected		>100	•	· · · · · · · · · · · · · · · · · · ·						1 1 1 1 1
MT: analyte not tested			<u>.</u>	:	analyte detected in blank	cted in blar	*	:		equipment wash blank	blank
ND: analyte not detected. NS: No standard criteria of	· Action L	evel curren	tly exists.	ä	estimated value, below quentification limit field blank (ambient condition blank)	tue, petoa c (ambient cor	puentificat relition bla	100 C)	T: Tiel	rield replicate resample	
				•				ì			

HT: analyte not tested
HD: analyte not detected in blank
HD: analyte not detected.
HD: analyte not detected in () are 2nd column confirmation values.

A: values listed in () are 2nd column confirmation values.

B: field blank (ambient condition blank)

R: resample

R: resample

R: resample

A: field replicate

R: resample

R: resample

A: field replicate

R: resample

A: field replication limits

A:

TABLE 4.1.19-3 (continued)

				Standards, and Action	Criteria Levels (a)	19-C-35S BAFB-0183	19-C-158 BAFB-0188	19-C-158 BAFB-0189	19-C-15B BAFB-0208	19-C-158 BAF8-0209	19-C-158 BAFB-0210
Parameter	Method	Detection Limit	Units	Federal	State	12/02/88	12/08/88	12/08/88	12/08/88	12/08/88	12/08/88
Percent Moisture	ASA49	V/R	×	SE	SE	20.9	17.9	18.8	21.2	12.8	24.9
TFM-Diesel	TFH-DI	0.0	mo/kg	SH	SE	8 %	9	2	2	2	2
TFM-Gen	TFH-GA	S.	mo/kg	SH	SZ	2	9	2	皇	2	2
Aluminum	Su6010	20.0	Mo/kg	SE	SZ	16600	14900	10900	14700	7720	14600
51.5	\$16 010	10.0	Mo/kg	SE	10,000	8	352	159	171	102	8
Beryllius	Su6010	0.50	ma/kg	SZ	ĸ	0.51	2	2	유	2	2
Colcius	Su6010	5	MO/kg	SE	S	3830	2080	4270	5110	3780	2340
Chronium	Su6010	3.0	mo/ko	SX	200	29.5	55.1	35.3	45.4	30.3	38.1
Cobelt	S46010	4.0	Mo/kg	SZ	8,000	16.4	37.5	27.8	33.9	14.9	25.3
Copper	S46010	3.0	mo/ko	SE	2,500	30.6	7.69	48.2	56.6	38.4	48.3
5	Suc 010	10.0	mo/kg	SE	SE	23300	36300	28200	34500	21300	30200
Megnesius	SW6010	5	mo/ko	SZ	SE	4400	8220	7020	9029	2720	5810
Handanese	Stu6010	1.5	mo/kg	SE	SE	8	1860	1060	1150	53	1080
Mickel	Su6010	6.	mo/kg	SE	2,000	29.0	37.0	56.6	24.1	13.8	20.0
Potassica	Succo10	8	Mo/kg	SE	SH	3 5	585	904	431	**	28
Silver	Su6010	3.0	Mo/kg	SE	200	2.8	2	9	2	2	2
Sodice	Su6010	5	mo/kg	SE	SH	9 62	38 1	5	174	155	522
Vanedius	Succo10	0.4	mo/kg	SZ	2,400	6.64	8 51	8.3	\$	76.5	77.6
2inc	Su6010	2.0	10/k 0	S	2,000	43.5	8.3	63.5	75.3	37.0	4.8
Methylene Chloride	SH8240	0.005	MO/kg	SH	SI	0.007	300.00	BJ 0.005	BJ 0.004	BJ 0.003	BJ 0.004
Acetone	Su6240	0.010	mo/kg	SH	SE	0.025	3 0.018	9 0.054	B 0.062	9%0.0	B 0.047
Di-n-buty bhthelete	Su6270	0.33	mg/kg	SE	SE	0.29	2	0.48	97.0	77.0	2
Fluoranthene	Su6270	0.33	mo/kg	SE	SE	0.29	2	2	皇	윺	2
bis(2-ethylhexyl)phthalate	SM6270	0.33	10 /kg	SE	SE	0.25	3 0.055	9	0.080	0.070 L	9

e: equipment wash blank f: field replicate R: resample MI: analyte not tested

MI: analyte not detected.

MI: analyte not detected in () in field replicate

MI: analyte not detected.

MI: analyte not denetification limit for detected.

MI: analyte not denetification limit for detected.

MI: analyte not denetification limit for detected.

MI: analyte not detected in field replicate

MI: analyte not detected.

MI: analyte not detected in limit for detected.

MI: analyte not detected.

MI: analyte not detected in Diant for detected.

MI: analyte not detected. 8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

for Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.19-3 (continued)

				Standards, and Action	Criteria Levela (a)	19-C-258 BAFB-0234 1	19-C-258 MFB-0235 7 0.8 51	19-C-258 BAFB-0236	19-C-258 BAFB-0237 27 0-28 51	19-C-258 BAFB-0236 37 0-38 51	19-C-258 BAFB-0239
Parameter	Hethod	Limit	Units	Federal	State	12/13/88	12/13/88	12/13/88	12/13/88	12/13/88	12/13/88
Percent Moisture	ASA#9	W / M	×	SE	SE	13.3	21.9	16.7	20.8	19.2	19.4
Mercury	27.77	0.00	mo/kg	SH	8	0.081	0.00	0.084	0.076	0.074	0.087
Atminu	SNA6 010	20.0	mo/kg	SN	SE	9240	10800	12200	21700	11000	12800
Berice	S 2010	10.0	mg/kg	SH	10,000	141	147	173	274	162	216
Beryllium	Stu6 010	0.50	20/kg	SE	ĸ	₽	2	9	0.76	2	2
Calcium	\$46010	5	mg/kg	SH	S	3110	0904	3930	6520	4020	9827
Chromium	State 010	3.0	10/kg	SH	200	33.3	24.3	35.3	51.8	38.4	31.8
Cobelt	Stu6 010	6.0	MO/kg	SN	8,000	17.3	12.8	32.9	28.7	30.1	23.6
Copper	SW6 010	3.0	mo/kg	SN	2,500	35.4	40.7	45.9	68.2	48.1	0.04
Iron	Stu6 010	10.0	Mo/kg	SE	SE	19700	21800	32400	40200	2931.0	25100
Magnes i un	Stu6 010	5	MO/kg	SE	S	3330	3920	2760	9860	6110	2250
Manganese	Stu6 010	1.5	#6/kg	SZ	S	539	864	1260	1340	1050	1070
Rickel	Stu6 010	4.0	mg/kg	ST	2,000	17.3	19.2	54.6	32.4	21.0	21.1
Potassium	Stu6 010	9 02	mg/kg	SH	SE	592	333	2	624	2	9
Silver	Sta6010	3.0	mg/kg	SE	200	6.9	2	9	윺	2	9
Sodium	Sta6010	5	MQ/kg	SN	SE	152	98	5	529	161	3
That ties	SW6010	20.0	MQ/kg	SE	2	2	2	윺	63.1	2	9
Vanadium	Sta6010	6.0	MQ/kg	SZ	2,400	58.8	53.1	7.86	102	93.2	76.4
Zinc	Suc 010	2.0	mg/kg	SE	2,000	=	7.69	61.3	7.68	61.4	51.6
Methylene Chloride	SMB240	0.005	mg/kg	SZ	SE	0.016	0.020	0.010	8 0.028	0.032	0.12
Acetone	SM8240	0.010	MQ/kg	SE	SE	0.027	0.019	0.04	욮	0.00	7 900.0
Benzene	SMB240	0.005	mg/kg	SE	SE	욮	0.007	욮	2	욡	욮
Toluene	SW8240	0.005	mg/kg	SE	SH	0.023	0.039	0.012	0.010	0.012	0.013
Phenol	SW6270	0.33	MQ/kg	SE	SE	1.3 8	2	2.2	3 2.0 1	8 2.4 1	1.78
Di-n-butyiphthelete	SW6270	0.33	mg/kg	SE	S	0.43 8	1.48	78.0	30.06	8 0.58	0.58 8
bis(2-ethylhexyl)phthalate	SM6270	0.33	mg/kg	¥	S.	2	0.090	1760°C	37 0.092	91	0.11 8
MOTES: Results reported for detected analyt	detected	: 8	anty.								

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) Most analyte not tested

MS: analyte not detected.

MS: Analyte not detected.

MS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

		Detection Limit	thits	Standards, and Action Faderal	Criteria Levels (a) State	19-C-3SB BAFB-0311 8.5-10.0*	19-C-3SB BAFB-0312 18.5-20.01 01/05/89	19-C-3SB BAFB-0313 28.5-30.0* 01/05/89	19-C-3SB BAFB-0314 38.5-40.01 01/05/89	19-C-358 BAFB-0315 48.5-50.01 01/05/89
		****	•		3	9	21.5	14.5	:	
rercent Moisture	ANNE	K / E	• ,	2 :	2					
Aluminum	Su6010	0.02 20.0	10/kg	Ş	Ş	15700	14,000	15900		
Berice	Stu6 010	10.0	mo/kg	S	10,000	Ē	97.5	149		
	Su6010	5	mo/kg	SH	SE	2440	4740	2020		
	Sub010	3.0	ma/kg	SE	200	39.1	45.4	45.9		
Cobelt	516010	0.4	mo/kg	SH	8,000	19.0	15.3	22.8		
Comer	Su6010	3.0	mo/kg	SR	2,500	56.5	48.0	50.5		
Iron	Su6010	10.0	mo/kg	SE	SH	30300	26500	34900		
Hearesium	S46010	5	mo/kg	SE	SE	8390	2690	9950	4290	5250
Manage	Su6010	1.5	mo/kg	SE	SE	455	580	923		
Hickel	Su6010	0.4	MQ/kg	SE	2,000	27.8	27.3	24.7		
Potassica	Su6010	200	MO/kg	SH	SE	%	395	263		
Sodium	Su6010	5	mo/kg	SE	SE	\$3	203	Z		
Vanadium	Su6010	4.0	mo/ko	NS	2.400	3.5	58.0	98.6		
Zinc	Su6010	2.0	mo/kg	SE	2,000	80.9	67.3	68.3		
Methylene Chloride	S48240	0.00	mo/kg	SH	SE	0.053	3 0.031	B 0.025		_
Acetone	S46240	0.010	ma/kg	SE	SE	0.032	8 0.036	B 0.020		~ •
trans-1.2-Dichloroethene	S-8240	0.002	mo/ko	SE	SE	2	2	2		
2-Butanone	Su6240	0.010	MQ/kg	SE	S¥	2	0.008	J 0.007	_	_
Trichloroethene	Su6240	0.005	mo/kg	SR	2.040	0.00	2	2		
Totuene	SM6240	0.00	/kg	SE	SE	0.038	0.013	0.044		_
Di-n-butylphthelate	SW6270	0.33	MQ/kg	SE	SH	0.25	2	0.43	09	3

B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. (): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Mitrite given as Nitrate.

TABLE 4.1.19-3

BEALE AFB: WATER DATA 1ST ROLMD SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 19

				Standards, Criteria and Action Levels (Standards, Criteria and Action Levels (a)	19-C-1GV	19-C-1GW	19-C-2GV	19-C-3GM	19-C-1SW	
		Detection				BAFB-0479	BAFB-0528	BAFB-0517	BAFB-0516	BAFB-0487	
Parameter	Method		Chits	Federal	State	02/24/89	04/18/89	03/31/89	03/31/89	03/09/89	
6	F120 1	1.0	umhos/cm	SE	8	0.4	862	&	592	8	
Total is commercially	170	**	0 040	SI	S	20.0	21.2	21.0	6.6	15.0	
	150	*	7	5-9	S	7.03	7.02	6.9	7.08	07.7	
A16-1 (1-16-1-17-1-17-1-17-1-17-1-17-1-17-1-17	7		i 7	20	SE	7.72	H	8.5	85.8	42.4	
Alkalinity - joint	100	-		S	S	8	H	117.4	194.7	51.7	
Total Discolved Colide	F166 1		Ì	200	200	385	H	712	281	5 0	
Chioride	£325.3	-	Ž	250	220	81.8	F. W.	28.5	24.2	5.0	
Fline ide	E340.2	0.050	/4	~	1.4	0.16		6.3 6.3	0.32	2	
Mittate + Mittate	£323.3	0.050	\	101	45	12.5	H	19.6	19.8	2.2	
Silfate	E373.4	1.0		220	22	25.7	H	19.4	13.8	60	
Chamical Oxygen Demond (COD)	E410.4	7.0	1	E	SE	20.6		₽	2	52.4	
Areasic	0902AS	0.0050	/	8	ક.	윺		욡	윺	0.0150	
	547421	0.0050	ž	ક	s.	₽	Ħ	0.0170	윷	2	
	TEM-GA	•		SE	SE	Ħ	욡	2	₽	0.20	
1 1 2 1 4 1	010978	9	\ \ \ \ \	S	SH	28.0		22.1	16.3	8.76	
	SLEKO10	001.0	\ \ \ \	1	'n	2	Ħ	2	웆	0.307	
	010978	9	7	S	SE	15.9	≒	14.2	10.4	3.44	
	010978	0.0150	7	8	8	0.0310	H	₽	≆	9	
	010978		\	SE	S	2.00	Ħ	2	1.20	9	
	STAND STAND	5	``	S	S	31.9	H	24.1	28.6	11.4	
Zio.	S146010	0.0200	*	0.110	0.012	1.22	Ħ	0.0250	0.0250	9	
Methylene chloride	Su 6 010	,	7	S	SE	9	M	₽	9	5	
			2192						• • • • • • • •	· · · · · · · · · · · · · · · · · · ·	,
MOIES: Results reported for Detected enem	70120	STRIFTED CITY		68	analyte detected in blank	cted in bla	ž		e: equi	equipment wash blank	
ND: analyte not detected.					estimated value,	lue, below quanti	quantification	ion (imit	f: fiel	field replicate	
NS: No standard criteria or action level	action L		currently exists.	ة	field blank (ambient condition blank)	(BILDIENT CO	ndition blan	Ç.	X T688	resemble and a second s	

b: analyte detected in them.
J: estimated value, below quantification limit
b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

TABLE 4.1.19-3

BEALE AFB: WATER DATA 2ND ROUND SAMPLING 1989

AMALYTICAL RESULTS TABLE FOR SITE 19

				Standards, and Action	Criteria Levels (a)		19-C-2GM	19-C-3GN	19-C-3GH		19-0-304
Parameter	Method	Detection Limit	caits	Federal	State	BAFB-0579 06/07/89	BAFB-0578 06/07/89	BAFB-0580 06/08/89	BAFB-0581 06/08/89	BAFB-0582 06/08/89	8AFB-05&3 06/08/89
Specific Conductivity	E120.1	1.0		S	8	225	30 2	220	270		-
Temperature	£170.1	N/A	- C	SE	SH	20.5	20.5	20.0	20.0	H	
***	E150.1	N/N	ā	2-9	SH	7.02	6.85	7.03	7.03	H	
Alkalinity - Total	S#4 03	1.0	Ž	ଥ	SZ	63.6	8.5	86. 86.	8.06	H	=
Bicarbonate	\$14 03	1.0	Ž	SH	SZ	77.6	114.9	109.6	110.8	H	Ħ
Total Dissolved Solids	E160.1	3.0	7	200	200	ž	30	331	285	33.0	Ħ
Chloride	E325.3	1.0	7	8	9 2 2	26.8	7.92	25.2	22.5	욮	H
Fluoride	E340.2	0.020	7	7	1.4	0.16	0.22	0.22	0.24	呈	H
Hitrate + Hitrite	E353.3	0.050	7	\$	45	21.0	22.6	19.3	19.8	0.37	Ħ
Sul fate	E375.4	1.0	7	220	0 <u>%</u>	13.9	20.7	16.0	16.5	2	Ħ
Calcium	Suc 010	9.1	7	SE	S	16.2	21.9	17.1	17.0	2	H
Negnesium	Suc 6010	9.5	7	SE	SH	9.71	14.2	11.2	11.0	2	=
Hanganese	Su6010	0.0150	Ž	s.	s.	0.0580	9	9	2	9	N.
Potassium	Su6010	. .	7	\$ 2	S¥	9	2	9	1.20	⊋	H
Sodium	Su6010	- 8:	7	SE	SE	21.5	22.6	28.5	£.	웆	
2 inc	Su6010	0.0500	7	0.110	0.012	2	0.0250	2	0.0420	0.0410	H
Methylene chloride	Sub 010	'n	7	SH	SH	2	9	2	2	13(19)	•
Chloroform	SMB 010	-	7	S	5	2	9	2	2	3(3)	3(4)
Trichloroethene	Sub 010	-	3	5	S	3(5)	9	2	2	욡	
Toluene	\$46 020	-	3	14,300	5	2(1)	8(2)	9	4	(4)2	
M-Witrosodiphemylamine (1)	SMB270	2	7/85	SE	SH	40	9	9 18	9 18	8. 6	_
bis(2-Ethylhexyl)Phthalate	SW6270	5	7	SH	SH	2	9	9	9	50 B	H H

MOTES: Results reported for detected analytes only.

MI: analyte not tested

MD: analyte not tested

MD: analyte not detected.

MD: analyte not detected in blank

MD: analyte not detected.

MD: analyte not detected.

MD: analyte not detected in blank

MD: analyte not detected.

MD: analyte not detected in blank

MD: field blank (ambient condition blank)

MD: field replicate

MD: field replication limit for blank)

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				Standards,	s, Criteria					4	
		•		and Action	m Levels (a)	19-C-4GV	19-0-154	19-C-1SM		19-C-1SN	
Parameter	Method	Detection	units	Federal	State	66/08/89	8AF8-0595 06/13/89	BAFB-05% 06/13/89	8AFB-0597 06/13/89	66/13/89	
Specific Conductivity	E120.1	1.0	Cathos/Ca	SE	006	222	1200	1200	=)	
Temperature	£170.1	4/	o o o	S	S	21.0	28.0	28.0	H	*	
**	E150.1	K/N	Z	2-9	S	6.85	7.11	7.12	IN	=	
Alkalinity - Total	204 03	1.0	7	2	SE	68.2	199.0	206.4	H	12	
_	S944 03	1.0	Ž	SE	SH	83.2	242.8	251.8	T#	=	
Total Dissolved Solids	£160.1	3.0	7	20	200	212	929	663	웊	H	
Chloride	E325.3	1.0	7/02	220	220	31.0	148	127	2	H	
Fluoride	E340.2	0.020	7/0	7	7.1	0.28	97.0	97.0	9	H	
Nitrate + Mitrite	E353.3	0.020	7	1 0	\$	18.7	1.3	0.93	0.43	#	
		7.0	7/2	220	220	16.0	110	128	욮	Ħ	
Chemical Oxygen Demand (CCD)	_	7.0	7	S	S	2	137	8	욮	×	
Berice	Stu6010	0.100	7	SE	SE	9	0.130	0.132	2		
Calcium	Suc 010	8.	7/0	SE	S	15.3	0.74	6.7.9	2		
Chromium	S16010	0.0300	7	S	S¥ (9 :	0.107	0.108	2		
- Lron	Su6010	0.100	7	r,	M;	2	0.168	0.151	€ :	*	
Megnesica	Sucoto	90	2	S	S	9.8	9.92	27.2	9 9	늘 :	
Mangahese		0.0130		S :	ë:	2 :	VI	121.0	2 :		
Potassium		38		9 1 2 1	S 4	₽ ⁽	6.50	3 5	9 9	Z 3	
2001 CE		300		115	C10 C	0750	y 9	0.420	25		
Chloroform	S-200	•	3	SE	90	9	2	2	(4)4	3(4)	
Carbon tetrachloride	SIMB010	-	1/9	*	5	1(2)	9	9	9	2	
Trichloroethene	SL6010	-	1	. 10	· •	3(4)	9	2	9	2	
foluene	SUB 020	-	7/00	14,300	9	2	•	2(1)	2	1(4)	
Ethylbenzene	SNB 020	-	7	3	9 9	2	8	~	₽	2	
meta-Xylene	270070	•	7/85	SZ	N	2	8	8	3	윺	
ofp-Xylene	SWB020	- ;	7/05	SI.	¥	2	m	m	2	a	
Phenol	SW6270	2 9	7	SE	¥	9	•		2	H	
2-Hethylphenol	27975	2 :	7	S	S	2	₽ '	-	€	T	
4-Methylphenol	SW8270	2 (7	SZ	S	€ :	in i	2 ·	2	Z	
Benzoic Acid	S46270	2 3	7 : 25	SE	SZ	2	~ (~ ·	9	X	
Nephthalene	SH6273	29	5	SZ	S	3		~	2	X	
M-Nitrosodipheny(smine (1)	2729	2 \$	3	2 2	S :		- °	٠,	.		
Phenenthrene	250270	2 \$		2 4		2 9	و ه	ב °	2 9	= ;	
	240270	2 \$	3	9 4	2 2	2 9	€ "		? 9		
Pyrene Society Control of the Control	2 CAC	2 5	3 5	2 4	2 2	⊋ ⊊	00	0 ×	2 9	<u> </u>	
	S46270	2 €	3	2 2	2 9	2 9	V 10	* *	2 £	= \$	
Chrysere his/2-5thv/hexv/)Dhths/ste	222	2 9	7	e v	2 4	<u>.</u>	-		2 9		
Berro(h)fluoranthene	0.70	•	<u> </u>	7	2 4	` `	9		9	= =	
Benzo(k) fluoranthene	SM6270	2	3	S	S	2	2	1 147	9	: Z	
Senzo(a)pyrene	SM6270	2	1/65	SE	S	2	9	m	2		
VICTOR Beautiful Contract and Land Contract Cont	de ferrense	analytee	215								
MT. society not tested				å	Tooler of begone and and lane	to let us be seen	,			And it does to promit the	į
MD: analyte not detected				-		1.1	- mantificat	in limit	; ;	field certicate	£
MO. SERVICE INC. SECENTARY			•	;				5	-	ם וכלוויםוני	

MD: analyte not detected.

WE shall be standard criteria or action level currently exists.

WE WE standard criteria or action level currently exists.

WE WE standard criteria or action level. See Appendix I.

The federal standard for Mitrate + Mitrite is given as 10 mg/l as Nignagen which is equal to the State of California Standard of 45 mg/l reliable most price as Nitrate + Mitrite given as Mitrate + Mitrite given as Mitrate + Mitrite given as Nignagen which is equal to the State of California Standard of 45 mg/l

TABLE 4.1.19-3

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1969

ANALYTICAL RESULTS TABLE FOR SITE 19

				Standards, and Action	Standards, Criteria and Action Levels (a)	19-C-1GN		19-c-3GH	19-C-4GM	19-C-1SW	
Parameter	Method	Detection Limit	Gaits	Federal	State	BAFB-0631 09/08/89	BAFB-0629 09/07/89	BAFB-0630 09/07/89	BAFB-0632 09/11/89	BAFB-0651 09/18/89	:
	E120 1	-	mp/ow/ca	SN	8	922	æ	780	588	52	:
Specific conductivity		?		S	SI	20.5	20.5	21.0	22.5	15.5	
	1.0513	* * *	7 1	2-6	SZ	7.24	2.30	4.79	7.33	7.45	
Attachinities - Total	1	•	· 7	2	SH	62.0	8.0	83.0	7.02	25.6	
Ricettonete	107	0,	Ì	S	SE	3.6	115.9	101.3	62.9	31.2	
Total Dissolved Solids	£160.1	O.	7	200	200	219	240	228	241	52.0	
Chloride	E325.3	-	7	X	220	30.8	23.7	24.8	32.0	4 .1	
	6740	020	Ì	7	1.4	0.15	0.22	0.23	0.21	2	
Mitrate + Mitrite	E353.3	0.050	ì	10.	3	27.8	22.7	21.1	18.1	1.9	
Sulfate	E375.4	1.0	//	22	220	14.0	20.0	14.0	17.0	6. 5	
Chamical Oxygen Demond (COD)	E410.4	7.0	7	S#	ST	9	24.0	9	2.2	24.1	
	010978	1.00	7	S#	SX	17.5	22.3	16.4	15.0	8.4	
	01034	0.100	Ì		'n.	₽	2	₽	2	0.149	
Memorita	01097	9	Ž	SZ	SE	10.3	14.1	10.3	9.45	5 .	
Monagana	Successor 10	0.0150	7	ş	ę.	2	9	9	2	0.0430	
	010342		ì	SZ	SX	2	2	1.45	1.19	2.30	
	SU6010	8	7	\$	S	21.1	70.7	27.1	25.7	3.34	
3ipc	010978	0.0200	7	0.110	0.012	2	2	2	욮	0.0620	
Trichlocoethene	010		7	'	5	3(3)	9	8	2(3)	£	
Tolumbe	S12020		3	14,300	5	2	_	13	2	2	
M-Witrosodichenvissine (1)	Su6270	5	7	SH	SH	2	7 V	<u>-</u>	9	-	
bis(2-Ethylhexyl)Phthalate	Su6270	2	1/85	SH	S	••	79	~	2	70	;
MOTES: Besuits reported for detected and	detected	anelytes only.	antv.	•	* : : : : : : : : : : : : : : : : : : :	• • • • • • •	· · · · · · · · · · · · · · · · · · ·	1 5 6 1 1)
NT: enelyte not tested				ä	enelyte detected		¥	:	e: equi	equipment wesh blank	
ND: enalyte not detected. NS: No standard criteria or action level	action le		currently exists.	ä	estimated value, field blank (and	- ^	e, below quantification limit abient condition blank)	on timit	7: 7:6 R: 7:66	rield replicate resample	
	•			•							

WI: analyte not tested

We analyte not detected.

We at and and criteria or action level currently exists.

We at and and criteria or action level currently exists.

We at and and criteria or action level. See Appendix I.

We have represent most stringent standard, criteria or action level. See Appendix I.

We have represent most stringent standard of 45 mg/l as Nitrate + Nitrite given as Nitrate.

We have a standard for Nitrate + Nitrite given as 10 mg/l as Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.19-3

BEALE AFB: MATER DATA 4TH ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 19

				Standards, and Action	Criteria Lewels (a)	19-C-1GN	19-c-2GN	19-C-3GU	19-C-4GN	19-C-15W	
		Detection			:	BAFB-0699	BAFB-0701	BAF8-0698	BAFB-0725	BAF8-0731	
Parameter	Hethod	Limit	Spi ta	Federal	State	11/19/89	11/20/89	11/19/89	12/01/89	12/05/89	:
Specific Conductivity	£120.1	0.	Carbos/Ca	SE	8	222	320	987	922	610	
Temperature	E170.1	W/W	၁	N	SE	20.5	21.0	20.0	19.0	7.0	
	£150.1	4/ N	Z	5-9	SH	7.29	7.23	7.38	7.57	4.15	
Alkalinity - Total	204403	1.0	7	2	SE	4.3 8	97.2	8.3	82.0	H	
Bicarbonate	SPK 03	1.0	7	SH	SZ	78.6	118.6	115.7	100.0	Ħ	
Total Dissolved Solids	E160.1	3.0	Ž	200	200	263	235	272	542	445	
Chloride	E325.3	1.0	7	220	220	28.8	26.8	24.6	32.2	24.8	
Fluoride	E340.2	0.050	7	~	1.4	0.55	0.26	0.32	0.28	0.28	
Mitrate + Mitrite	E353.3	0.050	Š	1 0	45	19.7	13.3	16.2	18.1	6.2	
Sulfate	E375.4	1.0	Ž	220	220	12.8	50.9	욯	18.0	320	
Chemical Oxygen Demand (COD)	E410.4	7.0	ž	SE	SH	2	윺	윺	2	77.9	
TFH-Diesel	TFM-DI	0.050	Š	SN	SE	0.070	0.050	0.070	090.0	0.16	
Aluminum	Stu6010	0.200	/02	SE	S#	7.23	윺	2	2	3.00	
Berice	Stu6010	0.100	Ž	SH	SR	0.131	2	율	2	2	
Cachrium	Su6010	0.0100	ž	SE	SE	2	2	2	2	0.0369	
Calcium	Stat 6010	. 8	Ž	S#	SZ	18.6	22.5	17.1	16.0	4.6.7	
Chronium	SW6 010	0.0300	7	SE	SE	2	유	9	2	0.137	
Cobelt	SW6010	0.0400	7	SE	S	9	2	윺	9	0.0552	
Copper	Suc 6010	0.0300	7	SE	SE	2	9	윺	2	3 9	
Ica	Sta6010	0.100	7	'n	ĸ.	11.2	2	2	ş	4.67	
Hegnes i un	Successor 5	. 8	7	SE	SZ	11.6	14.4	10.4	9.83	14.5	
Manganese	Sta6010	0.0150	7	ક	8	0.388	2	9	2	1.22	
Hickel	Stu6 010	0.0400	7/2	1	∢.	2	2	9	2	0.0631	
Potassium	Stat6 010	- 8.	Ž	SH	SE	1.22	2	1.25	2	69.7	
Sodiu	S 46010	. 8	7	SE	SE	20.B	22.0	28.1	27.1	7. 62	
2 finc	SW6 010	0.0200	7	0.110	0.012	0.0210	2	윺	윺	2.44	
Trichloroethene	Suc 010	-	7	.	S	()	2	2	2(3)	30(0)	
Tetrachloroethene	SM6 010	_	7	2000	~	5 (0)	2	1 <u>.</u>	욮	2	
Diethylphthelate	SH6270	2	- - -	S	S	•0	# 9	皇	윺	2	
N-Nitrogodiphenylamine (1)	SH8270	2	- - -	SH	S	~	7	_	5	7 ~	
Di-n-Butylphthelete	S146270	2	7	S	S	~	9	£	=	78 9 89	
bis(2-Ethylhexyl)Phthalate	sw6270	2	1/8	S	S	2	9	9	2	2	
											:

8: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

(soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.19.1.5 Discussion of Analytical Data

Contaminants in the form of fuel hydrocarbons, silver, chromium, mercury, dioxins/furans, PCP, and other organic compounds were detected in soil samples collected within the EHB. Soil samples from beneath the basin and groundwater samples also contained some of these contaminants. Table 4.1.19-4 presents the range of contaminants encountered for each of the media sampled (surface sediment, soil, groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections or surrogate spike recoveries.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the limit of quantification. These detections may represent laboratory "noise," and some of the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study, the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.19.2 Sampling and Analytical Problems

4.1.19.2.1 Loss of Samples

There were no sample loss problems for Site 19 samples. One groundwater sample was resampled due to a holding time violation for TFH-gas. One soil analysis for TFH-diesel (boring 19-C-2SB, 2.0 to 3.5 feet) was not completed due to laboratory handling problems. All other scheduled analyses were completed for Site 19 samples. The omission of the one TFH-diesel analysis is not considered critical to the evaluation of this site.

Table 4.1.19-4
RANGES OF CONTAMINANTS DETECTED AT SITE 19

CONTAMINANT ANALYTE	CHIKS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS # SAMPLES
SURFACE SOIL	• • • • • • •		************	
mercury	mg/kg	ND	0.14	2/6
TfH-diesel	mg/kg	ND	3,800	3/6
TFH-gas	mg/kg	ND	720	3/6
silver	mg/kg	2.8	53.0	6/6
chromium	mg/kg	20.2	288	6/6
toluene	mg/kg	ND	0.055	3/6
4-methyl-2-pentanone	mg/kg	ND	(0.006)	2/6
xylenes (total)	mg/kg	ND	0.53	1/6
bis(2-ethylhexyl) phthalate	mg/kg	ND	1.4	1/6
di-n-butyl phthalate	mg/kg	ND	0.72	3/6
fluoranthene	mg/kg	ND	8.8	2/6
butyl benzyl phthalate	mg/kg	ND	1.1	1/6
2-methylnaphthalene	mg/kg	ND	11	1/6
naph th lene	mg/kg	ND	1.6	1/6
pentach Lorophenol	mg/kg	ND	3.6	1/6
tetra dioxins	mg/kg	0.00003	0.00003	1/1
penta dioxins	mg/kg	0.0001	0.0001	1/1
hexa dioxins	mg/kg	0.0028	0.0028	1/1
hepta dioxins	mg/kg	0.0188	0.0188	1/1
octa dioxins	mg/kg	0.069	0.069	1/1
tetra furans	mg/kg	0.0001	0.0001	1/1
penta furans	mg/kg	0.0003	0.0003	1/1
hexa furans	mg/kg	0.0017	0.0017	1/1
hepta furans	mg/kg	0.0091	0.0091	1/1
octa furans	mg/kg	0.023	0.023	1/1
SOIL BORINGS				
mercury	mg/kg	ND	0.090	6/16
silver	mg/kg	NO	6.9	1/16
chromium	mg/kg	22.9	55.1	16/16
toluene	mg/kg	ND	0.044	11/16
benzene	mg/kg	ND	0.007	1/16
2-butanone	mg/kg	ND	(0.008)	3/16
trans-1,2-dichloroethene	mg/kg	ND	0.008	1/16
bis(2-ethylhexyl) phthalate	mg/kg	NO	(0.080)	3/16
di-n-butyl phthalate	mg/kg	ND	0.48	3/16
GROUNDWATER				
lead	mg/l	ND	0.017	1/15
manganese	mg/l	ND	0.388	3/15
toluene	ug/l	ND	13.0	5/15
trichloroethene	ug/l	ND	3.0	6/15
SURFACE WATER			.	
TFH-gas	mg/l	ND	0.20	2/4
chromium	mg/l	ND	0.137	2/4
barium	mg/l	NO	0.131	2/4
fluoride	mg/L	NO	0.46	1/3
iron	mg/l	0.149	4.67	4/4
Manganese	mg/l	ND	1.22	3/4
arsenic	mg/l	ND	0.0150	1/4
toluene	ug/l	ND	2.0	1/4
ethyl benzene	ug/l	ND	2.0	1/4
xylene (total)	ug/l	ND	5.0	1/4
phenol	ug/l	ND	11.0	1/4
2-methylphenol	ug/l	NO	17.0	1/4

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ.

4.1.19.2.2 Likelihood that Positive Samples were Contaminated in the Field or Laboratory

Soil samples collected at Site 19 contained several organic compounds, which were probably laboratory- or field-induced false positive results. Many of the soil samples collected contained acetone and methylene chloride. These are common laboratory contaminants and were also found in some of the method blanks.

Several soil samples contained the semivolatile compounds bis(2-ethylhexyl) phthalate and di-n-butyl phthalate. These compounds were also detected in some of the method blanks. The phthalate compounds were commonly detected in samples from throughout the base and are probably false positive results.

Phenol was detected in eight soil samples at concentrations ranging from 1.3 mg/kg to 2.2 mg/kg. Phenol contamination in soil samples has been traced to a factory-contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg.

Toluene was detected in most of the soil samples at low concentrations. This occurred for samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is a false positive result.

Two soil samples had estimated TCE concentrations below the LOQ. TCE was also detected in the method blanks associated with each of these samples. Although TCE is not a common laboratory contaminant, the concentrations estimated below the LOQ and presence in the laboratory blank suggests that TCE is a false positive in these soil samples. One field replicate QC soil sample was collected at Site 19. For the most part, the analytical results are very similar with the exception of TFH-diesel which had a RPD of 63 percent.

In the second round water samples, n-nitrosodiphenylamine was detected below the LOQ in both the sample and the matrix blank for all samples, including field replicates and wash blanks.

In the 8270 analysis of the fourth round sample from well 19-C-2, diethylphthalate, n-nitrosodiphenylamine, and di-n-butylphthalate were detected below the LOQ and in the

method blank. Di-n-butylphthalate was detected in the sample and the method blank for 19-C-4.

4.1.19.2.3 Analytical Results Obtained under Out-of-Control Conditions

The bromochloromethane surrogate spike for the third quarter 8010 analysis for 19-C-1SW was 131 percent, which exceeded the allowable range of 70 to 130 percent.

In the fourth quarter groundwater samples, the 8020 analysis surrogate spike recoveries for trifluorotoluene of 60 percent for 19-C-1 and 63 percent for 19-C-3 were below the acceptable range of 70 to 130 percent. The 8270 analysis surrogate spike recoveries of 21 percent for nitrobenzene-d5, 23 percent for 2-fluorobiphenyl, 31 percent for p-terphenyl-d14, and 15 percent for 2-fluorophenol for 19-C-1 were all below acceptable ranges. For 19-C-3, the recoveries of 8 percent for nitrobenzene-d5, 15 percent for 2-fluorobiphenyl, and 17 percent for 2-fluorophenol were below acceptable ranges.

4.1.19.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.19.3 Significance of Findings

Soils

Surface soil samples were collected from three locations in the bottom of the EHB. At each location an upper (zero to 1.0 feet BGS) and a lower (1.0 to 2.0 feet BGS) sample was collected.

TFH-diesel and -gas were detected in the upper and lower surface soil samples at one location at concentrations of 3,800 and 720 mg/kg (upper) and 290 and 70 mg/kg (lower), respectively. TFH-diesel and -gas were detected in the upper sample and its field replicate at one other location at concentrations of 340 and 650 for the TFH-diesel and 280 and 210 mg/kg for the TFH-gas. No DHS TTLC is available for TFH analytical results. The LUFT cleanup standards calculated for these samples are 1,000 mg/kg for TFH-diesel, and 100 mg/kg for TFH-gas.

Metals were detected in soil samples from the EHB at concentrations higher than averaged from soil background values

plus two standard deviations. Silver, not typical in background samples from other sites at Beale AFB, was detected in all six soil samples from the EHB at concentrations ranging from 2.8 to 53.0 mg/kg. Chromium was detected at 288 mg/kg in the upper sample from 19-C-1SS and at 139 mg/kg in the field replicate at 19-C-ISS. The upper end of the statistical range (mean plus twice the standard deviation) used to categorize chromium levels in the soil as statistically above background, was 46 mg/kg. In relation to apparent naturally occurring chromium levels at Beale AFB, some samples from the EHB have high chromium concentrations. DHS TTLC for chromium III is 2,500 mg/kg and 500 mg/kg for chromium VI. The ICP chromium concentrations are total chromium. The component concentrations of the two cations were not determined. Since each of the concentrations is below the DHS TTLC for chromium VI, the sampled soil in the EHB cannot be classified as a hazardous material by chromium content compared to TTLC.

Volatile organic compounds were detected in soil samples from the EHB. Toluene, methylene chloride, and acetone, were detected in many of the samples and some of the blanks, and are believed to be false positives. Total xylenes were detected at 0.53 mg/kg in one soil sample (19-C-3SS, zero to 1.0 foot). A DHS TTLC for xylenes is not available. The calculated LUFT recommended cleanup level is 1.0 mg/kg for xylenes.

Semivolatile organics were detected in one soil sample from the EHB. Pentachlorophenol (PCP), naphthalene, 2-methylnaphthalene, and fluoranthene were detected in one upper sample at concentrations of 3.6, 1.6, 11, and 8.8 mg/kg. The DHS TTLC for PCP in soil is 17 mg/kg. DHS TTLC values for the three other semivolatile organics were not available. By this criteria the PCP in the soil does not cause the soil to be categorized as a hazardous waste.

One randomly selected surface soil sample was analyzed for polychlorinated dioxins and furans. Tetra-, penta-, hexa-, hepta-, and octa-dioxins were detected at concentrations ranging from 0.00003 to 0.069 mg/kg (0.03 to 69 ug/kg). Similarly, tetra- through octa-furans were detected at concentrations ranging from 0.0001 to 0.023 mg/kg (0.1 to 23 ug/kg). Generally the dioxin or furan concentration was lowest with the tetra- species and increased towards the octa- species. Since only one soil sample was analyzed no patterns or trends may be made. The dioxin concentrations reported are for total isomers within isomer groups. The TTLC (0.01 mg/kg [0.00001 ug/kg]) is established specifi-

cally for 2,3,7,8 TCDD. Comparison of detected concentrations to the TTLC assumes that all detected TCDD is the 2,3,7,8 cogener form, which is highly unlikely.

An evaluation of toxicity equivalency was conducted to assess the approximate concentration of tetra through hepta isomer groups based on the relative toxicity to 2,3,7,8-tetraCDD. The results are given in Table 4.1.19-5. Because analysis of individual dioxin and furan congeners (210 potential congeners) was not conducted, the concentration of 2,3,7,8 congeners that could occur within each isomer group was estimated. This was based on the total possible 2,3,7,8 congeners that could occur within each isomer group, assuming each congener has an equal possibility of occurring. For example, the hexaCDD isomer group has 10 congeners of which 3 are 2,3,7,8 isomers. Therefore, the detected concentration of 2.8 ug/kg for hexaCDD is multiplied by 3/10 to obtain the estimated 2,3,7,8-congener concentration = 0.00084 mg/kg (0.84 ug/kg).

The toxicity equivalency analysis was completed using both EPA and DHS Toxicity Equivalency Factors (TEF). The total relative toxicity concentration (RTC) by the EPA method equals 0.000059 mg/kg (0.059 ug/kg) for dioxins and furans combined. The DHS method yields a relative toxicity concentration 0.000485 mg/kg (0.485 ug/kg), more than eight times higher than the EPA method.

Caution should be used when applying the RTC results to decision making processes. RTC results vary widely depending on the assumptions made and methods used in the calculations.

Soil Borings

One vertical background and two angled soil borings were drilled at Site 19. Aside from the probable false positive results for acetone, methylene chloride, and toluene, no organics were detected at quantifiable concentrations. Benzene and trans-1,2-DCE were detected in samples from the angled borings drilled beneath the photo waste emergency holding basin at angled sample distances of 7 and 48.5 feet (actual vertical depths of 6 and 42 feet). These compounds were found at or near the LOQ.

Silver was detected in one sample from an angled boring at a depth of 2 feet at 6.0~mg/kg. The DHS TTLC for silver is 500~mg/kg.

Table 4.1.19-5
TOXICITY EQUIVALENCY OF DIOXIN AND FURAN ISOMER GROUPS

	E	stimated 2,3,7,	8°			
	$Detected^{b}$	Congener			EPA ^f	CDHS ⁸
	Concentration	Concentration	EPAd (CDHS	RTC	RTC
Isomer Groups	(ug/kg)	(ug/kg)	<u>TEF</u>	TEF	(ug/kg)	(ug/kg)
Furan Groups						
TetraCDF	0.1	0.00	0.1	1.0	0.000	0.000
PentaCDF	0.3	0.02	0.1	1.0	0.002	0.020
HexaCDF	1.7	0.4	0.01	0.03	0.004	0.013
HeptaCDF	9.1	4.55	0.001	0.03	0.005	0.137
Total CDFs	11.2	5.00			0.011	0.170
Dioxin Groups						
TetraCDD	0.03	0.001	1.0	1.0	0.001	0.001
PentaCDD	0.1	0.006	0.5	1.0	0.004	0.007
HexaCDD	2.8	0.840	0.04	0.03	0.034	0.025
HeptaCDD	18.8	9.500	0.001	0.03	0.009	0.282
Total CDDs	21.7	10.347			0.048	0.315
Total CDFs						
and CDDs	32.9	15.346			0.059	0.485

^{&#}x27;Isomer groups analyzed. OctaCDD and OctaCDF were detected but are not part of toxicity equivalency evaluation.

Information in this table derived from "Chlorinated Dibenzo-P-Dioxin and Dibenzofuran Contamination in California from Chlorophenol Wood Preservation Use." Report No. 88-5WQ, Division of Water Quality, State Water Resources Control Board, March 1988.

^{*}Concentration of dioxin and furan groups detected. Actual concentrations may be higher based on low spike recovery data.

Estimated concentration of 2,3,7,8 congeners based upon possible number of 2,3,7,8 isomers within each isomer group.

^{&#}x27;EPA Toxicity Equivalency Factor.

^{&#}x27;California DHS Toxicity Equivalency Factor.

EPA Relative Toxicity Concentration (estimated 2,3,7,8 congener concentration x EPA TEF.

California DHS Relative Toxicity Concentration (estimated 2,3,7,8 congener concentration x DHS TEF).

Mercury was detected in all samples from 19-C-2SB at concentrations up to 0.090 mg/kg. The DHS TTLC for mercury is 20 mg/kg.

Surface Water

Four quarterly surface water samples were collected from the unnamed stream near Site 19. Chemical oxygen demand was 137 mg/l in the second quarter sample, higher than the first and third quarters and about twice the surface water COD measured in samples collected in the second quarter from Hutchinson Creek. The reason for this difference is not known.

Arsenic was present only in the first quarter surface water sample at 0.015 mg/l. The DHS Drinking Water Standard MCL for arsenic is 0.050 mg/l; the EPA Drinking Water Standard MCL is 0.100 mg/l. The arsenic level present in the first quarter surface water sample is below both Drinking Water Standards.

Chromium was only detected in the second quarter sample at 0.107 mg/l, and the fourth quarter at 0.137 mg/l, both of which exceeded the MCL of 0.05 mg/l.

Several inorganic parameters were detected at levels exceeding secondary MCLs for these compounds. Secondary MCLs have been established mainly to provide criteria for taste or odor, and do not necessarily reflect public health concerns. Iron exceeded the secondary MCL of 0.300 mg/l in the first round sample (0.307 mg/l) and the fourth round sample (4.67 mg/l). Manganese was 0.119 mg/l in the second round and 1.22 mg/l in the fourth round, above the secondary MCL of 0.05 mg/l. Zinc was 2.44 mg/l in the fourth round below the California secondary MCL of 5 mg/l. The 4.15 pH of the fourth round sample was below the Federal Clean Water Act Criteria of 5 to 9 pH. This low pH may account for some of the elevated metals concentrations. TDS was 654 mg/l in the second round, above the secondary MCL of 500 mg/l.

TFH-gas was detected in the surface water only in the first round, at 0.20 mg/l and TFH-diesel only in the fourth round, at 0.16 mg/l. No regulatory standards for TFH-gas or diesel in surface water were available.

Contaminants detected in surface water are believed to originate from a unknown source other than Site 19.

Groundwater

TCE was detected in the second, third, and fourth sampling rounds at wells 19-C-1 and 19-C-4 at 2 to 4 ug/1, which is below the EPA MCL of 5 ug/1. Carbon tetrachloride was detected in the second quarter sample from well 19-C-4 at the detection limit of 1 ug/1, below the MCL of 5 ug/1, but was not detected in the third quarter sample. Manganese was detected at 0.058 mg/l in the second round sample and 0.388 mg/l in the fourth round sample from well 19-C-1, above the secondary MCL of 0.05 mg/l. A lead level of 0.017 mg/l was detected only in the first round in well 19-C-2. MCL for lead is 0.050 mg/l and the EPA MCL goal is 0.020 mg/l. Zinc was also detected inconsistently in all four monitoring wells at levels below the California secondary MCL of 5.0 mg/1. General water quality parameters were all similar to those for groundwater sampled elsewhere on base.

4.1.19.3.1 Zones of Contamination

The zone of contamination at Site 19 is the clay liner in the EHB, which is classified as a toxic pit by the California RWQCB according to the TPCA on the basis of samples taken in April 1987. One of those samples had 1,300 mg/kg of PCP which was many times the 17 mg/kg TTLC. However, in the Stage 2-1 investigation of the six soil samples taken in the EHB, only one had detected PCP at 3.6 mg/kg. Soil samples from the vadose zone below the EHB and site groundwater samples do not contain concentrations of the analytes detected in the surface soil samples from the clay liner equal to or above EPA or California DHS action levels. Based on the samples collected and analyzed, the clay liner and concrete sides appear to have retarded the movement of the photo wastewater which was periodically stored in the EHB.

Based on four rounds of samples collected during Stage 2-1, the TCE in wells 19-C-1 and 19-C-4 is the only consistent characteristic of contamination detected in groundwater at Site 19. TCE was not known to be part of the photo wastewater stream and was not detected in the surface soils. The source of TCE is unknown.

4.1.19.3.2 Contaminant Migration

Soil

Based on comparison of analytes detected in the soil samples collected from the clay liner of the EHB with those in the

soil samples collected from two angled soil borings beneath the EHB, migration downward is not apparent.

Surface Water

Contamination detected in the surface water sample, believed to be from another source off site, will migrate in the surface water.

Groundwater

The TCE detected in groundwater would be expected to travel at approximately the rate of groundwater flow.

4.1.19.3.2.1 Potential to Move Off Site and Off Base

The potential for contamination detected in soil from the EHB clay liner to move off the site or off the base is low. Based on data from the two angled borings beneath the EHB, contamination is not migrating through the soil beneath Site 19.

The potential for contamination detected in the surface water near Site 19 to move off the site and off the base is high. Site 19 is about 16,000 feet from the edge of the base, estimated along the streams. Analytes similar to the arsenic and TFH-gas and diesel detected in surface water from Site 19 were not detected downstream at Site 6 or Site 13. This may be due to mixing and dilution of surface water as the unnamed stream joins with Hutchinson Creek. The surface water also flows towards the groundwater. Contaminants detected in the surface water, not necessarily originating from Site 19, may migrate to the groundwater.

TCE detected in groundwater samples at Site 19 will migrate off site. Following flow paths across the contour lines on Plates 3 and 4, Site 19 is about 12,000 feet from the base boundary.

4.1.19.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

The velocity of the surface stream was not measured at Site 19, but was estimated (based on observations) to range between 1 and 5 feet per second. Stream flow is generally to the west and south.

The average velocity of groundwater flow may be estimated by substitution into Darcy's Law. Using data derived from the

pumping well during the 72-hour pump test and an estimated effective transport porosity in the permeable materials of 0.20, the approximate velocity of groundwater movement beneath the EHB is about 0.84 feet per day, or 310 feet per year. The direction of groundwater flow at Site 19 appears to be to the southeast, although this cannot be concluded from the data. If flow is actually to the southeast, this probably represents localized flow conditions. Generally groundwater flow at Beale AFB is to the west.

4.1.19.3.2.3 Time of Travel to Receptors

Human receptors of surface water at or downstream of Site 19 would be those using water in Hutchinson Creek, west of the base. Based on the estimated stream velocity of 1 to 5 feet per second, surface water flowing past Site 19 will reach the base boundary in about 1 to 5 hours.

The nearest off base domestic or irrigation well to Site 19 is about 12,000 feet to the west. Based on observed regional groundwater flow conditions, groundwater would require many years to flow from Site 19 to the nearest off base well.

4.1.19.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 19 because of the complicated alluvial deposits in the subsurface.

4.1.19.3.2.5 Expected Spatial and Temporal Variations in Concentration

TCE concentration in groundwater from wells 19-C-1 and 19-C-4 were similar in the second, third, and fourth sampling rounds. At this time, temporal variability is unknown.

4.1.19.3.3 Baseline Risk Assessment

No risk assessment activities were performed as part of IRP Stage 2-1.

4.1.20 DISCUSSION OF RESULTS FOR SITE 20: SANITARY TREAT-MENT PLANT GREASE PIT

The grease pit is an unlined excavation located northwest of the sewage treatment plant. It is presently used to dispose of sewage plant clarifier skimmings. During the Stage 2-1 field work, the pit contained a liquid material with a foamy, greasy substance on the surface.

No investigations were done at the grease pit during Phase II, Stage 1. California RWQCB conducted limited surface water sampling in 1987. Grease pit fluid samples collected and analyzed by the RWQCB detected toluene at 1.8 mg/l, chloroethane at 0.16 mg/l, oil and grease at 6,800 mg/l, and total petroleum hydrocarbons at 1.5 mg/l.

During Stage 2-1, three surface soil samples were collected from within the grease pit and one angled soil boring was drilled beneath the pit.

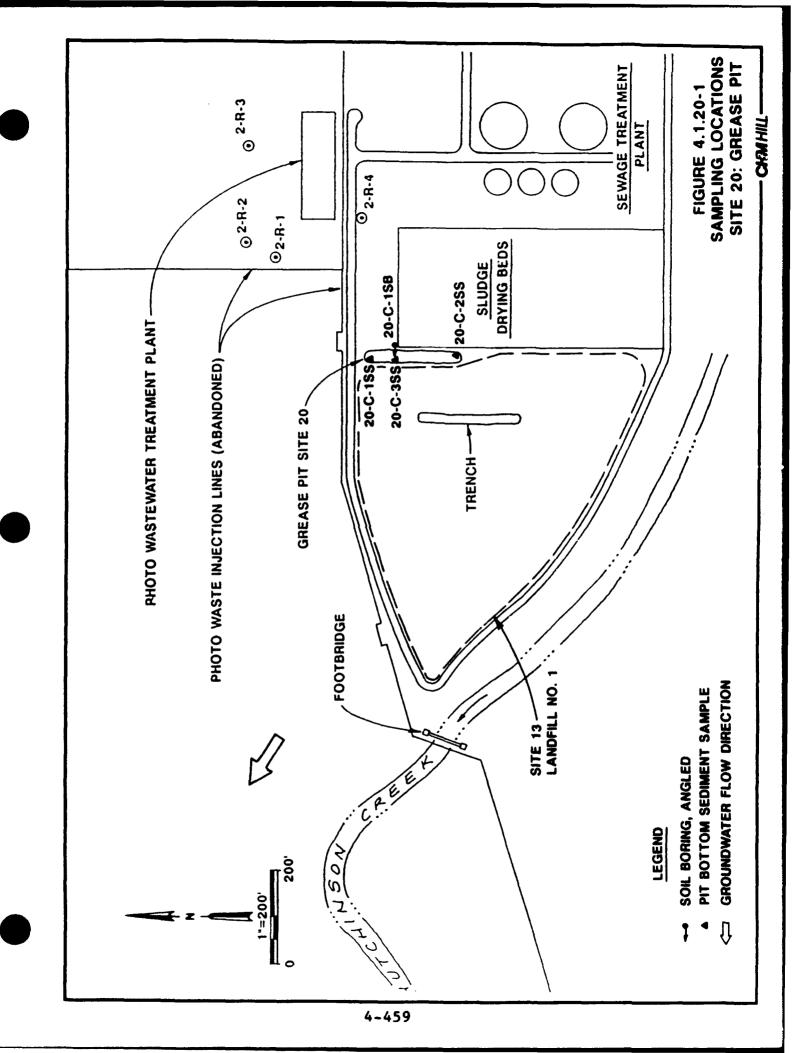
4.1.20.1 Presentation of Results

The following section presents the results of the field investigation at Site 20. The discussion focuses on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on soil samples.

4.1.20.1.1 Site Geology

Evaluation of the geology at Site 20 is based on a borehole drilled during the Stage 2-1 investigation and on drilling activities completed at nearby Sites 2 and 13. During the current investigation, one angled boring was drilled to a depth of 49 feet (42 feet beneath the ground surface). The location of this borehole is shown on Figure 4.1.20-1. A soil boring log is provided in Appendix D. Additional information on subsurface geology in the vicinity of Site 20 may be found in the discussion for Site 13, in Section 4.1.13.1.1.

The log of boring 20-C-ISB indicates that near-surface materials at the grease pit consist almost entirely of clays to the total depth of the hole. A clayey sand was encountered from a depth of about 11 to 19 feet in the hole. At 37 feet (33 feet vertically) and again at 47 feet (42 feet vertically), the lean clay varied to lean clay with sand. Otherwise, borehole 20-C-ISB contacted only lean clay. This predominance of fine-grained materials was also found in boreholes in adjacent Site 13.



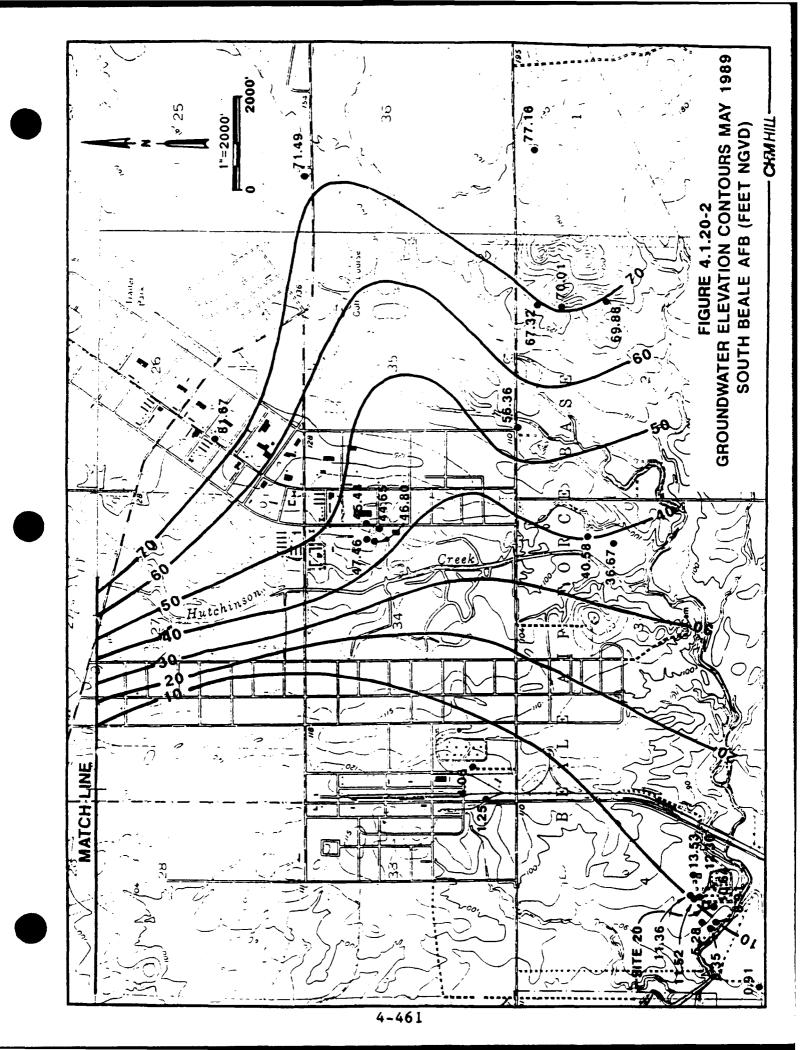
Near-surface deposits at Site 20 have been mapped as Quaternary river deposits by the Geological Survey (Page, 1980). These materials are recent channel and flood plain deposits from Hutchinson Creek. This alluvial sequence is predominantly fine-grained overbank deposits with occasional discontinuous sand and gravel channel deposits forming more permeable zones.

4.1.20.1.2 Site Hydrogeology

No wells were installed at Site 20. However, based on the investigation at Site 13, the first saturated permeable zone occurs from approximately 80 to 105 feet below grade, and may be partly confined at some locations.

Figure 4.1.20-2 presents a groundwater elevation contour map for the southern part of Beale AFB based on groundwater level data collected in May 1989. Plates 3 and 4 show contours from similar data collected in March and November 1989. These figures show that a large groundwater depression immediately west of Beale AFB controls groundwater gradients in the western part of the base. Several wells in the depression northwest of Site 20 are measured semiannually by the California Department of Water Resources. Water levels in these wells dropped steadily from the 1940s until 1981. From 1981 through 1987, the last year data were available, water levels have typically risen 20 feet or more in those wells. Based on Figure 4.1.20-2, the horizontal groundwater gradient in the uppermost permeable zone of the aquifer in the vicinity of Site 20 is approximately 0.007 feet per foot to the northwest.

Values of aquifer parameters derived from pump tests conducted on wells at Site 13 are useful as estimated values for Site 20. Transmissivity ranged from 230 to 1,200 square feet per day with an average value of 580 square feet per day. Hydraulic conductivity ranged from 11 to 74 feet per day with an average value of 32 feet per day (0.01 cm/sec). Storativity (a dimensionless aquifer property) calculated from observation wells ranged from 4.5 x 10⁴ to 9.6 x 10⁴. Because of the complexity of the groundwater system near Site 13, these values must be regarded as estimates. By substituting into Darcy's Law a value of hydraulic conductivity of 28 feet per day, as measured in the 72-hour pump test in well 19-C-4 and assuming an effective porosity of 0.20, the linear groundwater velocity at Site 13 was estimated at about 1 foot per day, or 360 feet per year.



4.1.20.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given with Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.20.1.4 and in Appendix A.

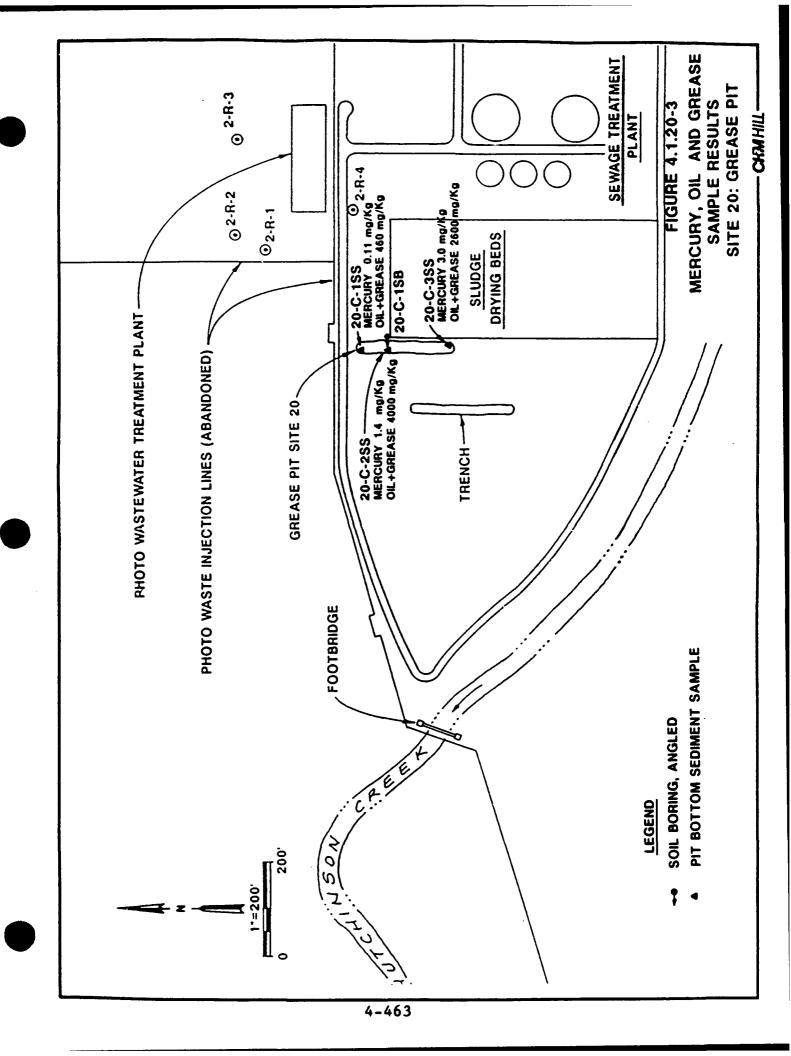
Three pit bottom sediment samples (20-C-ISS, -2SS, and -3SS) were collected in the Site 20 grease pit. One angled soil boring was drilled to a 50-foot depth underneath the pit; five samples were taken for analysis. These pit bottom sediment samples and soil boring samples were analyzed for volatile organics (8240), semivolatile organics (8270), ICP metals (6010), mercury (7470/7471), soil moisture (ASTM D2216), ignitability (1010), and oil and grease (9071).

Grease Pit Sediments

The following organic compounds were detected in pit bottom sediment samples: toluene at 2.0 mg/kg, phenol at 33 mg/kg, and 4-methylphenol at 13 mg/kg in 20-C-3SS; bis(2-ethylhexyl) phthalate at 6.3 mg/kg in 20-C-2SS; and 5.6 mg/kg in 20-C-3SS. The following metals were detected at concentrations above two standard deviations greater than background levels in grease pit sediment sample 20-C-2SS: silver (11.5 mg/kg), cadmium (2.2 mg/kg), copper (133 mg/kg), and zinc (189 mg/kg). In 20-C-3SS, barium was detected at 491 mg/kg, silver at 58.4 mg/kg, cadmium at 5.9 mg/kg, lead at 84.1 mg/kg, sodium at 8,190 mg/kg, and zinc at 411 mg/kg. Mercury was detected at 0.11 mg/kg in 20-C-1SS, 1.4 mg/kg in 20-C-2SS, and 3.0 mg/kg in 20-C-3SS (Figure 4.1.20-3). None of the pit bottom sediment samples were ignitable. Oil and grease were detected in 20-C-1SS at 460 mg/kg, in 20-C-2SS at 4,000 mg/kg, and in 20-C-3SS at 2,600 mg/kg.

Soils

Toluene was detected in boring 20-C-1SB at 0.036 mg/kg at 8 feet (7 feet vertically), 0.10 mg/kg at 18 feet (16 feet vertically), 0.050 mg/kg at 28 feet (24 feet vertically), 0.038 mg/kg at 39 feet, and 0.038 mg/kg at 48 feet (actual vertical depths of 7, 16, 24, 33, and 42 feet). 2-butanone was detected at 0.034 mg/kg at 28 feet, 0.025 mg/kg at



38 feet, and 0.018 mg/kg at 48 feet (24, 33, and 42 feet vertically). Carbon disulfide was detected in four samples below the LOQ. No semivolatile organic compounds were detected.

ICP metals were detected at levels similar to those typically found in background soil samples at Beale AFB. No mercury or oil and grease were detected in any soil boring samples. No soil boring samples were ignitable.

4.1.20.1.4 Analytical Results Table

Table 4.1.20-1 presents a summary of all detected analytes for Site 20. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.20-1 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.20.1.5 Discussion of Analytical Data

Contaminants detected at Site 20 included oil and grease and several metals (silver, cadmium, copper, mercury, lead, zinc) in the surface soil samples. A few volatile organic compounds were detected in the soil boring samples. Groundwater was not sampled at Site 20. Table 4.1.20-2 presents the range of contaminants encountered for each of the media sampled (surface soils and soil borings), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. These detections may represent laboratory "noise" and some of the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was

TABLE 4.1.20-1

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 20

			• • • • • • • • • • • • • • • • • • •		20-C-1SS	20-C-285	20-C-3SS	20-C-158	20-C-158	20-C-158
		Detection			0.0-1.0	0.0-1.0	0.0-1.0	7.5-9.0	17.5-19.0	27.5-29.0
Parameter	Hethod	Limit	Units	Federal State	11/22/88	11/22/88	11/22/88	69/01/10	69 /01/10	99/01/10
Derrent Moieture	ASAEO	V	×	SN SN	25.3	36.5	*	13.3	20.3	38.6
Mercine.	27775	0,060	mo/ko	MS 20	0.11	7.	3.0	2	2	2
Dile and Greese	20071	1.0	mo/ko	SH	93	4000	5 0092	9	2	2
	010978	20.0	a/ka	ST ST	15000	7320	14900	8790	15800	23600
Berin	St.6010	10.0	/\d	NS 10,000	147	90 2	167	120	108	%
	SLK6010	0.50	me/ko	MS 73	08.0	2	물	윺	2	9
	010975	1.0	mo/ko	NS 100	2	2.2	5.9	2	율	2
	Su6010	5	mo/ko	SN	3750	5530	6140	2790	906X	9080
	5146010	3.0 M	mo/kg	NS 500	36.5	38.0	56.4	30.9	35.3	74.3
Coheli	S146010	0.4	a/ko	MS 8,000	21.4	8.5	13.4	17.3	12.5	16.3
	St.6010	3,0	ø/ko	NS 2,500	38.0	133	192	27.9	30.1	58.5
	S146010	10.0	Mo/ko	SE	26800	11500	24500	20300	27100	38800
	S16010	20.0	ab/ka	1,000	2	9	3	2	욮	2
Menterin	Su6010	100	mg/kg	SE	3640	1610	3380	3930	4770	11600
	Su6010	1.5	mo/ka	SE	629	192	28 88	292	88	334
Michal	546010	0.4	ma/ka	MS 2,000	18.7	11.3	20.3	18.5	36.5	41.0
Dotage	SW6010	200	MO/kg	SN	535	2	625	2	252	958
Silver	SW6010	3.0	MO/ko	NS 500	2	11.5	58.6	¥	유	2
Sodium	SW6010	5	mo/kg	SN NS	&	580	8190	187	248	332
Thelling	SW6010	50.0	mo/kg	NS 700	9	욡	2	2	74.0	2
- Special	SW6010	0.4	mo/kg	NS 2,400	78.4	37.6	65.3	9.69	66.0	8.0
2 inc	Su6010	2.0	mo/kg	MS 5,000	53.3	189	117	W. 9	53.1	92.2
Methylene Chloride	SW6240	0.002	MO/kg	SE	 	0.85	76.0 F	0.000	0.016	0.026
Acetone	SNB 240	0.010	mg/kg	SN SN	욮	₽	1.7	J 0.028	0.029	0.040
Carbon Disulfide	SH8240	0.005	mg/kg	SN	2	2	₽ :	2	0.00	
2-Butanone	Su6240	0.010	MO/kg	SE	2	2	2	0.00	2	0.034
Toluene	SUB240	0.005	MO/kg	SM	2	2	2.0	0.036	0.10	0.050
Phenol	SW6270	0.33	MQ/kg	SZ SZ	2.7	3.0	33	2	2	2
4-Methylphenol	SIJB270	0.33	mg/kg	SN SN	욡	윺	13	2	2	₽ :
2 4-Dimethylphenol	SW6270	0.33		SZ	2	2	0.74	2	ક	2
Benzoic Acid	Su6270	1.6	mg/kg	SZ SZ	욡	윺	2.7	유 구	2	윤 :
Machthelene	SM6270	0.33	mo/kg	SN SN	2	99.0	울 구	웆	۽	2
2-Methylnachthelene	SUB270	0.33	mo/kg	SK SK	2	0.63	2	2	2	2
bis(2-ethylhexyl)phthalate	SW6270	0.33	mo/kg	SN SN	0.58	J 6.3	5.6	皇	2	2
										,

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) NOTES: Results reported for detected analytes only.
NT: analyte not tested
ND: analyte not detected.
NS: No standard criteria or action level currently exists.

(): values listed in () are 2nd column confirmation values. a: Values represent most stringent standard, criteria or action level. See Appendix I. * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

				Standards, and Action	Standards, Criteria and Action Levels (a)	20-C-15B BAFB-0320	20-C-158 BAFB-0321
Parameter	Method	Detection Limit	Units	Federal	State	01/10/89	01/10/89
Percent Moisture	ASA#9	K/X	×	SE	SE	20.6	18.1
Musica	Su6010	20.0	ma/ka	SE	S¥	15100	15900
Perio	SAMO 10	10.0	mo/ko	SE	10,000	114	201
Pervi Lium	S146010	0.50	ma/kg	SE	ĸ	2	0.61
Colcius	S 46010	5	mg/kg	SZ	SE	3680	5230
Chromical Chromical	S 46010	3.0	mo/kg	SE	200	38.4	75.5
Cobalt	S 46010	6.0	mo/kg	SE	8,000	18.9	31.3
Coper	SM6 010	3.0	MO/kg	SX	2,500	32.5	59.1
5	S46010	10.0	mo/kg	SE	SE	20300	36600
leanesium	S46010	5	mo/ka	SN	SH	4330	7880
Janaanese	S 46010	1.5	mo/kg	SE	SE	929	1380
Mickel	\$46 010	4.0	Mo/kg	SE	2,000	38.0	20.4
Potassium	S46010	9 2	mo/kg	SZ	SE	38	22
Sodium	S46010	5	mg/kg	SH	SZ	382	242
Thellium	Sa46010	50.0	mg/kg	SE	8	6.89	2
/anadium	SW6010	4.0	mo/kg	SE	2,400	48.4	116
tine	Su6010	2.0	MQ/kg	SH	2,000	52.6	70.5
tethylene Chloride	SM8240	0.005	M/kg	SR	SE	0.019	0.013
Icetone	SM8240	0.010	MQ/kg	SE	SH	0.038	0.032
Carbon Disulfide	SMB240	0.005	MQ/kg	SH	S¥	0.005	0.004
2-Butanone	SM8240	0.010	MO/kg	SH	SE	0.025	0.018
Toluene	SUR240	0.005	mo/ka	SE	SE	0.038	0.038

e: equipment wash blank f: field replicate R: resample MI: analyte not tested

MI: analyte not detected.

MI: analyte not detected in blank

MI: analyte not detected.

MI: analyte not detected.

MI: analyte not detected.

MI: field replicate

MI: field blank

MI: field blank

MI: field blank

MI: field blank

MI: field replicate

MI: field blank

MI: field blan NOTES: Results reported for detected analytes only.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

Table 4.1.20-2
RANGES OF CONTAMINANTS DETECTED AT SITE 20

CONTAMINANT ANALYTE	UNITS	MINIMUM CONC.	MAXIMUM CONC.	# DETECTIONS/ # SAMPLES
GREASE PIT SEDIMENTS			• • • • • • • • • • • • • • • • • • • •	
mercury	mg/kg	0.11	3.0	3/3
silver	mg/kg	ND	58.6	3/3 2/3
	•			-• -
beryllium	mg/kg	NO	0.80	1/3
cadmium	mg/kg	ND	5.9	2/3
copper	mg/kg	38	192	3/3
lead	mg/kg	ND	84.1	1/3
zinc	mg/kg	53.3	411	3/3
bis(2-ethylhexyl) phthalate	mg/kg	(0.58)	6.3	3/3
toluene	mg/kg	NO	2.0	1/3
oil and grease	mg/kg	460	4000	3/3
SOIL BORINGS				
copper	mg/kg	27.9	59.1	5/5
zinc	mg/kg	34.8	92.2	5/5
2-butanone	mg/kg	ND	0.034	4/5
toluene	mg/kg	0.036	0.10	5/5
carbon disulfide	mg/kg	ND	(0.005)	4/5

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals tisted are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

tentatively identified below the LOQ. For this study, the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.20.2 Sampling and Analytical Problems

4.1.20.2.1 Loss of Samples

There were no sample loss problems for Site 20 samples. No samples needed to be resampled and all scheduled analyses were completed for Site 20.

4.1.20.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 20 contained several organic compounds which were probably laboratory— or field-induced false positive results. All of the soil samples collected contained methylene chloride and many of the samples also contained acetone. These are common laboratory contaminants and are probably false positive results.

All of the grease pit sediment samples contained the semivolatile compound bis(2-ethylhexyl) phthalate. The phthalate compounds were commonly detected in samples from throughout the base and are probably false positive results.

Phenol was detected in all three surface soil samples at concentrations of 2.7, 3.0, and 33 mg/kg. The two lower concentrations have been traced to a factory contaminated bottle of acetone used in the extraction process. The laboratory estimated from analysis of soil method blanks that the induced contamination was 1.7 mg/kg. The highest concentration (33 mg/kg) represents a true positive result. Toluene was detected in one of the surface soil samples and all of the soil boring samples. Toluene was detected in samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent and low concentration suggest that it is a false positive result. For the soil replicate QC samples taken at other sites, in which toluene was detected, duplication of the toluene result was not good. This is another indication that the toluene is probably not a true contaminant present at the site.

No soil replicate $\hat{Q}\hat{C}$ samples were collected at Site 20.

4.1.20.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 16 samples.

4.1.20.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.20.3 Significance of Findings

Soil

Grease pit sediment samples were collected from three locations in the grease pit. Each had detected mercury from 0.11 to 3.0 mg/kg, oil and grease from 460 to 4,000 mg/kg, and phenol from 2.7 to 33 mg/kg. The surface sample from the south end of the grease pit, 20-C-3SS, had the highest mercury and phenol content; 20-C-2SS, from the west side near the center of the pit had the highest oil and grease concentration. 20-C-3SS also had detected silver and lead at 58.6 and 84.1 mg/kg, respectively. The DHS TTLC for mercury is 20 mg/kg; for silver, 500 mg/kg; and for lead, 1,000 mg/kg. All of the metals detected are at concentrations below the respective DHS TTLC.

One angled soil boring was drilled at Site 20. The detected ICP metals concentrations were generally similar to those detected in soil samples from other sites on base. Five volatile organic compounds were detected in all soil samples near, at, or below the detection limits. Acetone, 2-butanone, toluene, methylene chloride, and carbon disulfide were detected although some of these may represent false positives.

Geophysics

In conjunction with the investigation of Site 13, a geophysical investigation was conducted in the western side of Site 20 to determine if other trenches or grease pits existed. Seven areas of buried metal were delineated, as illustrated in Figure 4.1.20-4. The ground surface was irregular with depressions indicative of previous excavation and backfilling.

4.1.20.3.1 Zones of Contamination

The only contaminants apparent from the sampling conducted in Stage 2-1 at Site 20 are the oil and grease, phenol, mercury, lead and silver in the sediment in the bottom of the grease pit. Based on the sampling conducted in the Stage 2-1 study, the depth of contaminated soil has not been determined. However, none of these analytes were detected in soil samples from beneath the grease pit.

4.1.20.3.2 Contaminant Migration

Based on the angled boring results, there is no indication that contaminants are migrating beyond the grease pit sediments, and contamination is not expected to migrate from Site 20. Although the detected contaminants could potentially move downward through the soil, the lack of these in all soil samples collected from 20-C-ISB indicates that such migration is not taking place at the location of the angled soil boring.

4.1.20.3.2.1 Potential to Move Off Site and Off Base

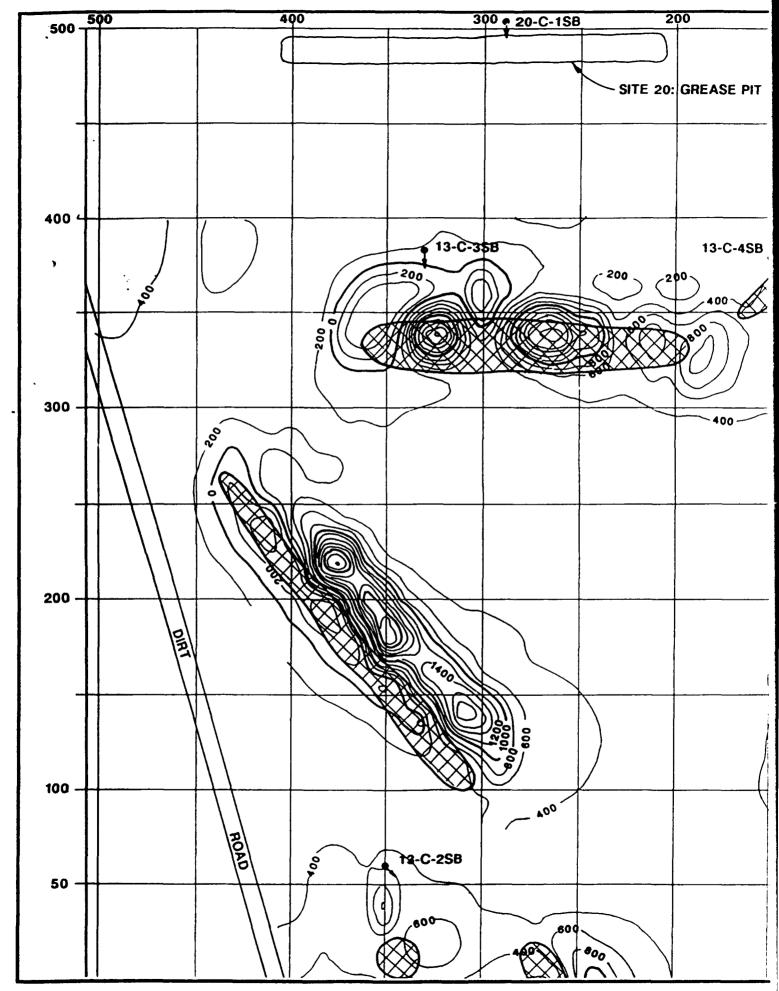
Based on sediment and soil sampling conducted in Stage 2-1, the potential for detected contaminants to move off the site or off the base is low. Samples from the angled soil boring indicate that contamination detected in the grease pit are not moving towards groundwater.

4.1.20.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

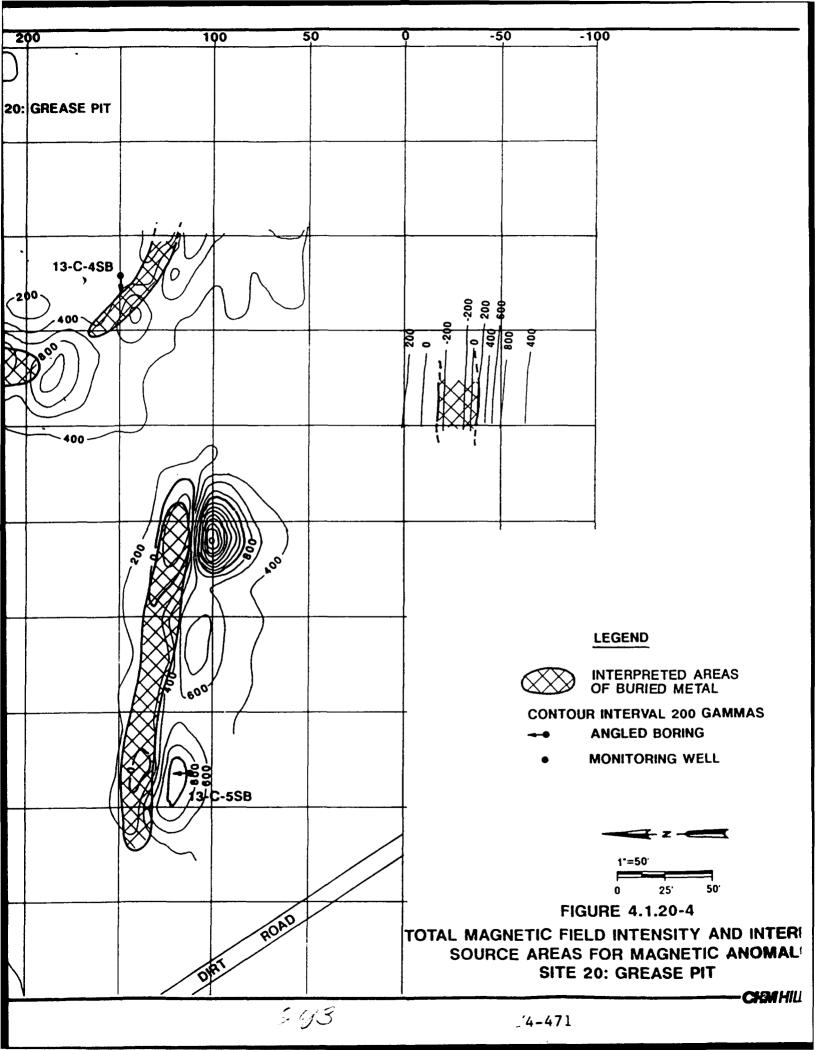
No groundwater studies were conducted at Site 20. This section is not applicable to Site 20. Groundwater was examined at Site 13 adjacent to Site 20. See Section 4.1.13.1.2 for more information.

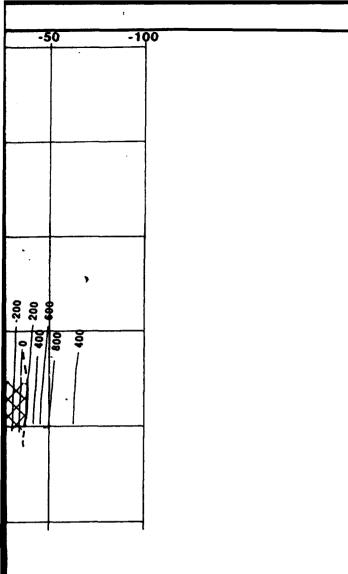
4.1.20.3.2.3 Time of Travel to Receptors

There are no known human receptors at Site 20. However, should contaminants from the grease pit migrate to ground-water, they would migrate to the west with the regional groundwater flow. Groundwater could reach the nearest off base domestic or irrigation well in about 5 years based on work completed at Site 13.



10/3





LEGEND



INTERPRETED AREAS OF BURIED METAL

CONTOUR INTERVAL 200 GAMMAS

- **ANGLED BORING**
 - **MONITORING WELL**

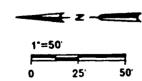


FIGURE 4.1.20-4

MAGNETIC FIELD INTENSITY AND INTERPRETED OURCE AREAS FOR MAGNETIC ANOMALIES

SITE 20: GREASE PIT

CHAM HILL-

4.1.20.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable because no groundwater studies have been conducted at Site 20.

4.1.20.3.2.5 Expected Spatial and Temporal Variations in Concentration

Vertical spatial variations were evident in the soil sampling conducted in Stage 2-1. Oil and grease, silver, and lead were detected in sediment samples from the grease pit, but not from soil boring samples to a vertical depth of about 42 feet beneath the grease pit. No further IRP sampling is scheduled at Site 20. Temporal variations cannot be determined from a single round of sampling.

4.1.20.3.3 Baseline Risk Assessment

No risk assessment work was conducted as part of Stage 2-1.

4.1.21 DISCUSSION OF RESULTS FOR SITE 21: ABOVE GROUND JP-7 FUEL TANKS AT THE FLIGHTLINE

The JP-7 above ground storage tanks are located between taxiway No. 6 and the main runway, west of Site 5, the SR-71 Shelter Drainage Area (see Figure 4.1.21-1). A bermed area, approximately 80 feet square, contains four 25,000-gallon horizontal tanks. Stormwater that accumulates within the bermed area is allowed to flow into a small ditch, which discharges to the field west of the tanks.

Many active underground fuel tanks and pipelines exist in the area but were not included in the Stage 2-1 activities. The JP-7 above ground fuel storage tanks have not previously been included in the IRP process at the base. Initial sampling was conducted during Stage 2-1 to determine if contamination exists.

Five surface samples were collected at Site 21 in Stage 2-1. Three of the samples were collected from within the bermed area surrounding the above ground tanks, and two from the drainage ditch downstream from the bermed area. All samples were analyzed for soil moisture and TFH-diesel and -gas.

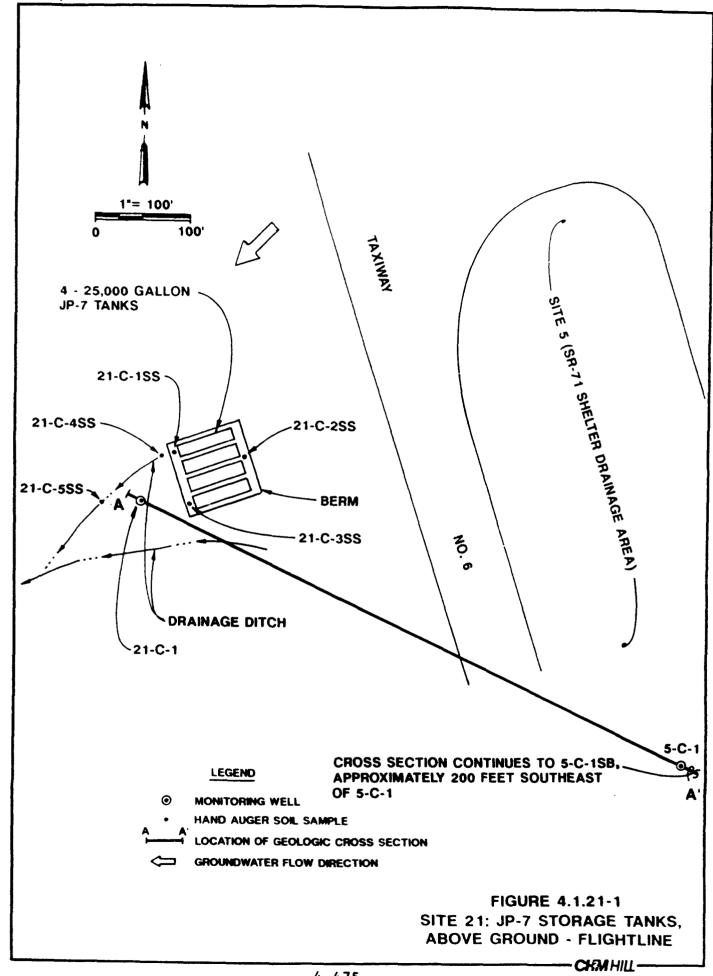
4.1.21.1 Presentation of Results

The following section presents the results of the field investigation at Site 21. The discussion focuses on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on groundwater and soil samples.

4.1.21.1.1 Site Geology

Evaluation of the geology at Site 21 is based on a borehole drilled during the current Stage 2-1 investigation and completed as a monitoring well and on drilling activities completed at nearby IRP Sites 1 and 5. The well at Site 21 was drilled to a total depth of 139 feet (-37 feet NGVD), and screened across the uppermost permeable zone at a depth of 104 to 124 feet BGS (-2 to -22 feet NGVD). The location of this well is shown in Figure 4.1.21-1. A soil boring log is provided in Appendix D. Additional information on subsurface geology in the vicinity of Site 21 may be found in discussions for Sites 1 and 5 in Sections 4.1.1.1.1 and 4.1.5.1.1.

A geologic cross-section prepared from soil boring logs of 21-C-1, 5-C-1 and 5-C-1SB is shown in Figure 4.1.21-2. This



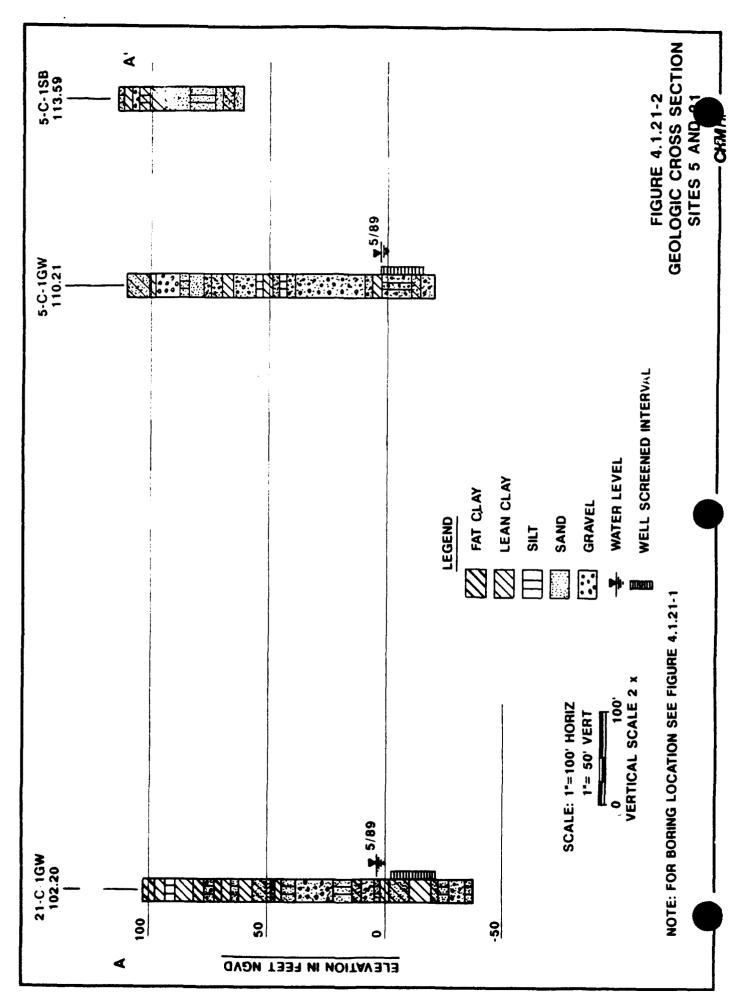


figure and the log of well 21-C-1 indicate that near-surface materials at Site 21 consist almost entirely of silts and clays to a depth of about 50 feet (52 feet NGVD). From this point to a depth of about 100 feet (2 feet NGVD), the borehole penetrated mainly sands that ranged from clayey and silty sands to coarse sands and gravel. This sand may correlate with thick sequences of sands noted in other boreholes in the flightline area of Beale AFB, such as 5-C-1 (Figure 4.1.21-2). From a depth of 100 feet to the total depth of the hole at 139 feet (-37 feet NGVD), the deposits varied from clays to sands.

Near-surface deposits at Site 20 have been mapped as near the contact of the Victor Formation and the Laguna Formation (Page, 1980). These units both consist of highly variable continental alluvial deposits, which are difficult to distinguish in the field. Both units are known to contain layers of cemented sediments. The soil boring log of well 21-C-1 indicates that several cemented layers were penetrated. Based on this log, no volcanics were contacted to the total depth of the hole.

4.1.21.1.2 Site Hydrogeology

The first wet cuttings in 21-C-1 were encountered in a clayey sand interval that extended from a depth of 108-112 feet (-6 to -10 feet NGVD). This unit was overlain and underlain by lean clay that yielded dry cuttings. At a depth of 121 feet (-19 feet NGVD), the hole contacted wet clayey sand again. This turned to silty sand at a depth of 124 feet (-22 feet NGVD) and was permeable enough to yield water from the hole during drilling. The sands continued yielding water to the total depth of the hole (-37 feet NGVD). The well was screened from 104-124 feet BGS (-2 to -22 feet NGVD), across the uppermost water-bearing deposits. Prior to development, an oily sheen was observed on the surface of water withdrawn from this well. Following development of 21-C-1, the water level in the casing stabilized at a depth of about 99 feet (3 feet NGVD), and the oily sheen has not been observed again.

Groundwater levels recorded in well 21-C-1 during 1989 are presented in Table 4.1.21-1 and in Figure 4.1.21-3. A complete summary of groundwater measurements, including elevations and depths to water, is provided in Appendix G. These measurements indicate that the groundwater level in well 21-C-1 has risen nearly 3 feet during 1989. This steady rise was typical for wells constructed in alluvium on the



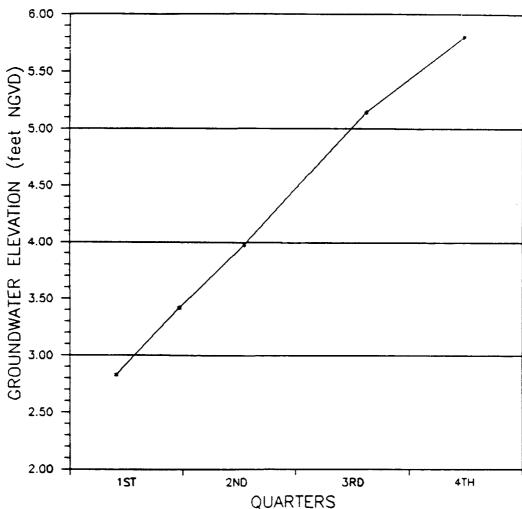


FIGURE 4.1.21-3

MONITORING WELL HYDROGRAP

SITE 21: JP-7 STORAGE TANKS

ABOVE GROUND - FLIGHT LINE

western edge of Beale AFB, and may reflect a long-term regional rise in groundwater levels.

Table 4.1.21-1 GROUNDWATER ELEVATIONS: SITE 21 (feet NGVD)

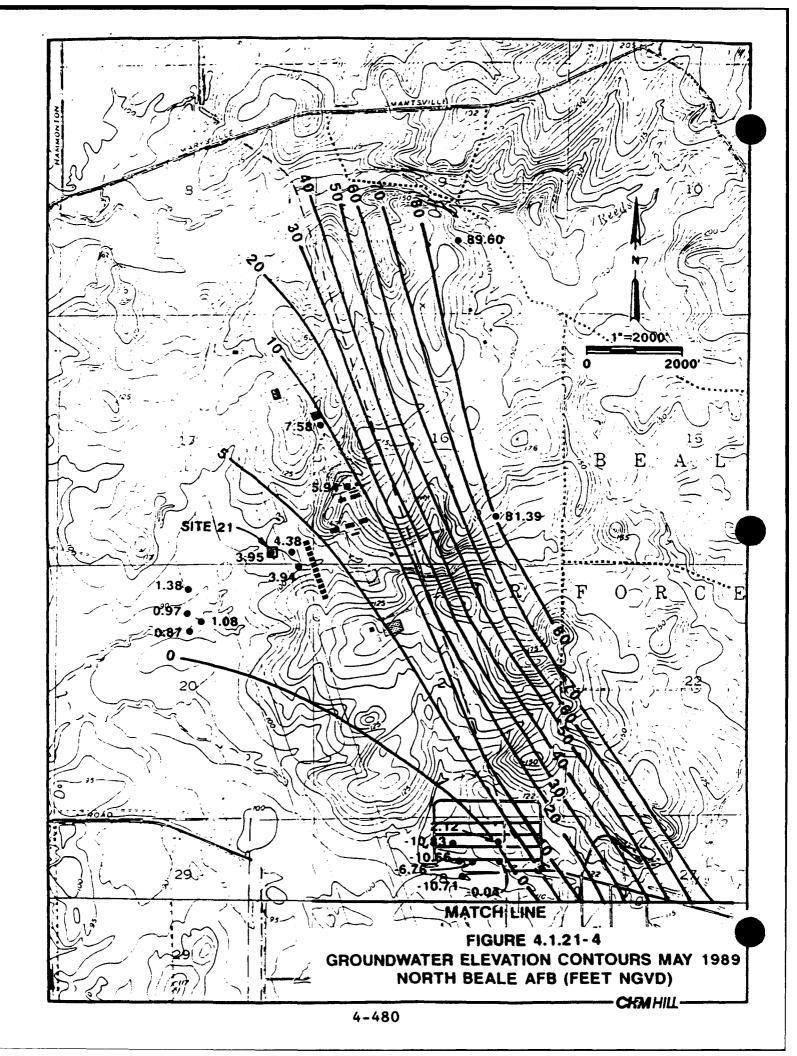
Well_	Screened <u>Interval</u>	February 1989	March 1989	May 1989	August 1989	November
21-C-1	125-104	2.83	3.42	3.98	5.14	5.80

Figure 4.1.21-4 presents a groundwater elevation contour map based on data from wells in the northern portion of Beale AFB collected in May 1989. Plates 3 and 4 show contours from similar data collected in March and November 1989. These figures show that groundwater in the vicinity of Site 21 is flowing to the southwest under the influence of the groundwater depression located immediately west of Beale AFB. Based on Figure 4.1.21-4, the horizontal groundwater gradient in the uppermost permeable zone of the aquifer in the vicinity of Site 21 is approximately 1 foot per 625 feet, or 0.0016. This low gradient may be due partly to the curve in the flowpath from west to southwest in response to the groundwater depression and partly to the possible presence of subsurface coarse-grained materials in this region of the base.

Well 21-C-1 was pump tested to derive aquifer parameters. Data were analyzed according to the recovery of step-drawdown method devised by Harrill (1970). A description of testing methodology and a plot of the data are provided in Appendix E. Based on this test, the transmissivity was 750 square feet per day, and the hydraulic conductivity was 37 feet per day (0.013 cm/sec). These values are very similar to those derived in nearby well 5-C-1. Groundwater velocity may be estimated by substituting into Darcy's Law. Using a hydraulic conductivity of 28 feet per day, as determined in the 72-hour test of well 19-C-4, a gradient of 0.0016, and an estimated effective porosity of 0.20, the approximate groundwater velocity is 0.2 feet per day, or 80 feet per year. However, this value is only an estimate.

4.1.21.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality



control results are given within Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.21.1.4 and in Appendix A.

Surface Soils

Five surface soil samples were collected at Site 21: three from within the bermed JP-7 tank area (21-C-1SS, -2SS, and -3SS) and two from the drainage ditch running west from the tanks (21-C-4SS and -5SS). These samples were analyzed for soil moisture (ASTM D2216) and TFH-diesel and -gas (California method).

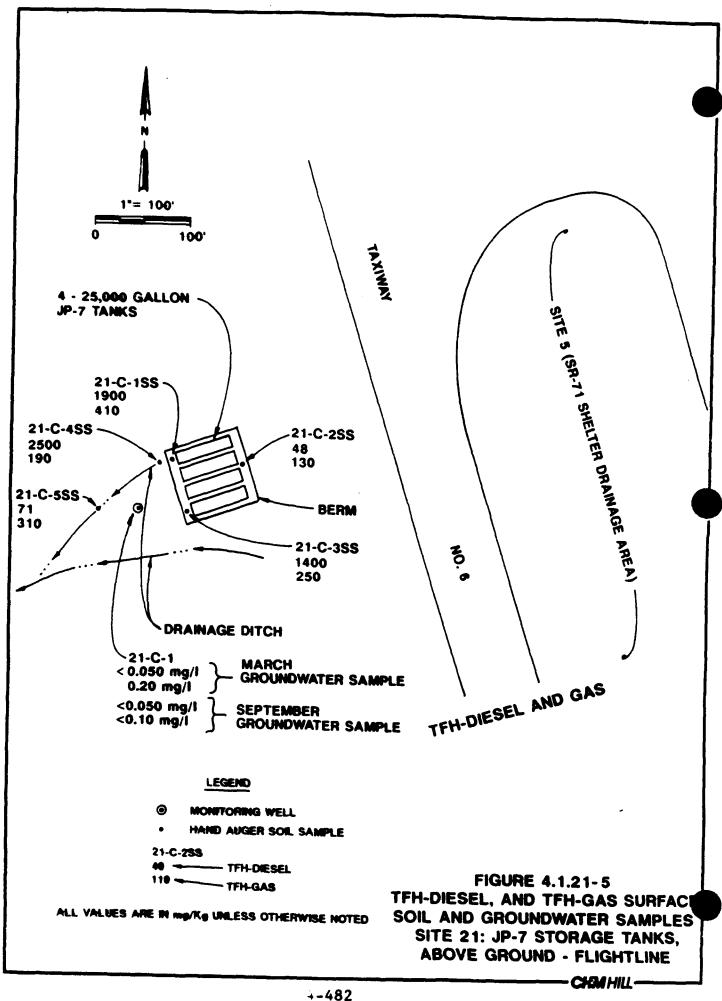
TFH-diesel was detected in all surface soil samples at 48 to 2,500 mg/kg (Figure 4.1.21-5). TFH-gas was detected in all surface samples at from 130 to 410 mg/kg.

Groundwater

Through the two semiannual rounds of water sampling at Site 21, three groundwater samples (two samples and one replicate) were collected from the new monitoring well 21-C-1. Analyses performed on the groundwater samples were purgeable halocarbons (8010), ICP metals (6010), water quality parameters, and TFH-diesel and -gas (California method).

Purgeable halocarbons and TFH-diesel were not detected in groundwater at Site 21 during the first semiannual sampling round (March 1989) of Stage 2-1. TFH-gas was detected at 0.2 mg/l. An oily sheen was noted on the groundwater surface in the first bailer of water removed from well 21-C-1 during development. TDS were 233 mg/l. Major anions and cation concentrations at this well are generally similar to other sites near the flightline at Beale AFB. Nitrite plus nitrate (expressed as nitrate) was 3.4 mg/l. Sulfate was higher than at other flightline sites at 30.8 mg/l.

A field replicate was collected with the second semiannual sample from 21-C-1. All analyses were comparable for the two samples. No purgeable halocarbons or TFHs were detected in this round. TDS were 163 and 176 mg/l. Nitrate plus nitrite (expressed as nitrate) were 6.3 and 4.7 mg/l. Sulfate values were 9.3 and 9.0 mg/l. Groundwater at Site 21 is a sodium bicarbonate type.



4.1.21.1.4 Analytical Results Table

Table 4.1.21-2 presents a summary of all detected analytes for Site 21. Analytical data are given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.21-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.21.1.5 Discussion of Analytical Data

Contaminants detected at Site 21 included TFH-diesel and -gas in the surface soil samples and possibly TFH-gas in the groundwater. TFH-diesel was detected in all five surface samples at concentrations from 48 to 2,500 mg/kg. TFH-gas was detected in all samples at 130 to 410 mg/kg. In the semiannual groundwater samples, TFH-gas was detected at 0.20 mg/l in the first round and not in the second. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections.

4.1.21.2 Sampling and Analytical Problems

4.1.21.2.1 Loss of Samples

There were no sample loss problems for Site 21 samples. No resampling was necessary and all scheduled analyses were completed for Site 21.

4.1.21.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

None of the detected analytes are considered to be false positive results.

No soil replicate QC samples were collected at Site 21.

4.1.21.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 21 samples.

TABLE 4.1.21-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 21

Personeter	Method	Detection Limit	Units	Standerds, and Action Federal	Standerds, Criteria and Action Levels (a) Faderal State	21-C-1SS BAFB-0035 0.0-0.04 11/18/88		21-C-3SS BAFB-0037 0.0-1.0' 11/18/88	21-C-2SS 21-C-3SS 21-C-4SS 21-C-5SS 8AFB-0036 BAFB-0037 BAFB-0038 BAFB-0039 0.0-1.0' 0.0-1.0' 0.0-1.0' 0.0-1.0' 0.0-1.0' 11/18/88 11/18/88 11/18/88 11/18/88	21-C-5SS BAFB-0039 0.0-1.0 ¹ 11/18/88
Percent Moisture ASAM9 IFN-Diesel TFN-DI IFN-Gas	ASA#9 TFH-DI TFH-GA	4,4 0.0 80.0	#0/kg	\$ \$ \$ \$	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	15.2 1900 410	15.9 48 130	12.2 1400 250	24.7 2500 190	22.9 71 310
NOTES: Results reported for detected analytes only. NI: analyte not tested. ND: analyte not detected. NS: No standard criteria or action lavel currently exists. (): values listed in () a-a 2nd column confirmation values.	detected action le 2nd colu	analytes on wel currenti	ly. ly exists rion value		B: analyce detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)	cted in blar lue, below c	nk quantificat ndition bla	ion limit ak)	e: equipment f: field re R: resemple	e: equipment wash blank f: field replicate R: resample
 a: Values represent most stringent standard, criteria or action level. See Appendix I. The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. 	ingent at itrate + n as Nitr ution = 1	andard, crit Nitrite is g ate. .0 and repre	given as 1 sent targ	oction level 10 mg/t as 1 pet detection	l. See Appe Nitrogen whi on limits. A	ndix I. ch is equal ctual detect	to the Star	te of Califa for each an	ornia Stand Nalysis are	d, criteria or action level. See Appendix I. te is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l I represent target detection limits. Actual detection limits for each analysis are given in Append

TABLE 4.1.21-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 21

				Standards, (riteria		
		Detection		and Action Levels (a)	evels (a)	21-C-1GW BAFB-0482	
Parameter	Method	rimit	Units	Federal	State	03/10/89	
Specific Conductivity	£120.1	1.0	untos/cm	SM	8	188	
Temperature	E170.1	W/H	o o	SE	SH	21.0	
	£150.1	N/A	7	6-5	SH	7.48	
Alkalinity - Total	S#403	1.0	7	2	SI	8.6 8.0	
Bicarbonate	SPK 03	1.0	7	SH	Ş	3 .98	
Total Dissolved Solids	E160.1	0.E	7	200	200	£	
Chloride	£325.3	1.0	7	220	220	15.0	
Fluoride	E340.2	0.050	7	~	1.4	0.33	
Eitente + Mitrite	E353.3	0.050	1/0	5	45	3.4	
Sul fate	E375.4	1.0	7	250	250	30.8	
15X-508	15E-5	0.10	7	SH	SZ	0.20	
Calcium	Su6010	1.8	7/2	SH	SZ	15.6	
Meanesius	Su6010	9:	7	SE	S	3.25	
Potessica	SW6010	9.5	<u>\$</u>	SZ	SZ	8·9	
Sodiu	St#6010	8.	7	SE	S	39.5	
Zinc	Suc 010	0.0200	7	0.110	0.012	0.166	

e: equipment wash blank f: field replicate R: resample B: enalyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) ND: analyte not detected. NS: No standard criteria or action level currently exists. WOTES: Results reported for detected analytes only. MT: enelyte not tested

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 For Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits are for dilution = 1.0 and represent target detection limits.

TABLE 4.1.21-2

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 21

				Standards, Criteria and Action Levels (a)	evels (a)	21-C-1GV	21-C-1GM		
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0624 09/06/89	BAFB-0625 09/06/89	BAFB-0623 09/06/89	BAFB-0622 09/06/89
Specific Conductivity	E120.1	0.1	Carbos/Ca	NS	8	5			L
Temperature	E170.1	K / N	deg C	SE	SH	21.5	Ħ	Ħ	H
1	E150.1	N/A	₹	2-9	SN	7.76	Ħ	=	H
Alkalinity - Total	SPK 03	1.0	7	2	SH	0.89	H	Z	Ħ
Sicarbonate	294403	1.0	/	SE	SH	83.0	H	H	Ħ
Total Dissolved Solids	E160.1	3.0	\d	200	200	163	176	욮	Ħ
Chlaride	E325.3	1.0	7	520	220	14.1	13.5	웆	
Fluoride	E340.2	0.050	7	~	1.4	0.17	0.18	0.050	Ħ
Nitrate + Mitrite	£353.3	0.020	7	5	45	6.3	4.7	0.89	
Sulfate	E375.4	1.0	7	250	250	9.3	9.0	2	
Calcium	SW6010	- 8	1/02	SN	Ş	12.6	12.5	2	H
Meanesium	Su6010	1.8	7	SX	SH	5.14	5.07	2	=
Manganese	SW6010	0.0150	7	ક	ક	0.0214	0.0209	呈	**
Potassics	SW6010	- 8	7/01	S	SE	1.97	2.34	2	1
Sodium	SW6010	9.1	1/2	SE	SH	18.9	18.9	2	E

WOTES: Results reported for detected analytes only. NT: analyte not tested

MD: analyte not detected.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) (): values listed in () are 2nd column confirmation values. NS: No standard criteria or action level currently exists.

e: equipment wash blank i: field replicate R: resample

a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Mitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

4.1.21.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.21.3 Significance of Findings

TFH-diesel and -gas were detected in all surface soil samples at concentrations illustrated in Figure 4.1.21-5. Samples collected within the bermed area had TFH-diesel concentrations between 48 and 1,900 mg/kg and TFH-gas between 130 and 410 mg/kg. The sample collected from the ditch nearest the bermed area had TFH-diesel and -gas of 190 and 2,500 mg/kg; the sample collected 75 feet downstream was 71 and 310 mg/kg. DHS TTLC values for TFH-diesel or -gas were not available. LUFT cleanup standards were calculated and are 1,000 mg/kg for TFH-diesel, and 100 mg/kg for TFH-gas.

One monitoring well was constructed and sampled twice during Stage 2-1. No wells previously existed on the site. The first semiannual round groundwater sample collected had 0.20 mg/l TFH-gas detected (Figure 4.1.21-5), but TFH-gas was not detected in the second (semiannual) round. No regulatory standards for TFH-gas in groundwater were available.

4.1.21.3.1 Zones of Contamination

Based on the samples collected, the surface soil within the bermed tank area is contaminated with fuel hydrocarbons. The source of the contamination is leaks and spills from the above ground fuel tanks. Soil lining the drainage ditch which carries stormwater from the area is also contaminated with fuel hydrocarbons, although the depth cannot be determined from sampling conducted in Stage 2-1. TFH-diesel concentrations decrease in the downstream direction.

Groundwater from 21-C-1 may be contaminated with TFH-gas based on the first semiannual round sample, although the source of this is not necessarily the JP-7 fuel tanks. TFH-gas was not detected in the second semiannual round. A background well was not available for comparison.

4.1.21.3.2 Contaminant Migration

The fuel hydrocarbons detected in the soil within the bermed area at Site 21 may have migrated into the drainage ditch. It is not known if the fuel hydrocarbons detected in the samples from the ditch were transported by stormwater from the bermed area or resulted from a spill or leak directly

into the drainage ditch. Surface water samples were not collected from the drainage ditch at Site 21 during Stage 2-1.

The fuel hydrocarbons in the soil may be moving vertically towards the groundwater. However, a defensible conclusion cannot be made about the source of TFH-gas in the groundwater at Site 21 based on one detection from two sample rounds collected from the single monitoring well. Although a Site 21 background well was not constructed during Stage 2-1, wells constructed at Sites 4, 5, and 11, all located upgradient of Site 21, may be used for reference. No TFH-diesel or -gas was detected in monitoring wells at any of these sites. This indicates that the source may be located north or west of Site 5 and upgradient of Site 21.

4.1.21.3.2.1 Potential to Move Off Site and Off Base

The potential for the fuel hydrocarbons to move off Site 21 and off the base is high. Site 21 likely contributes to the fuel hydrocarbons detected in surface water and sediment samples at Site 1, about 2,000 feet to the west. Based on stream flow visual observations made during rainfall in Stage 2-1, fuel hydrocarbons transported by surface water flowing in the drainage ditch will cross the base boundary within 15 or 20 minutes after leaving Site 21.

The groundwater in the area is moving to the southwest, and the TFH-gas detected in the groundwater will also move in this direction. The potential for this TFH-gas to migrate off the site is high.

4.1.21.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Groundwater at Site 21 moves to the southwest, towards the groundwater depression west of the base. The estimated interstitial groundwater velocity is about 80 feet per year, based on hydrogeologic investigations conducted at the base. Because of the lack of well-defined parameters relating to migration rates of TFH-gas in mixed flow, the rate is assumed to be that of the groundwater.

4.1.21.3.2.3 Time of Travel to Receptors

If contaminants pass into groundwater, users of base and domestic supply wells to the west of the site could be potential receptors. Based on estimates of groundwater velocity in the immediate vicinity of well 21-C-1, it would

take many years to reach the nearest production wells. However, groundwater contamination may have been occurring for years.

4.1.21.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 21 because of the lack of well-defined parameters required for accurate modeling.

4.1.21.3.2.5 Expected Spatial and Temporal Variations in Concentration

TFH-gas was detected in the first semiannual sampling round at 0.20 mg/l. TFH-gas was not detected in the second semiannual sampling round at a LOQ of 0.10 mg/l. From the limited available data at Site 21, an accurate estimate of expected spatial and temporal changes in concentrations cannot be made.

4.1.21.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.22 DISCUSSION OF RESULTS FOR SITE 22: ABANDONED UNDER-GROUND TANKS

There were approximately 750 underground storage tanks in the area of the Beale AFB previously occupied by Camp Beale, a World War II Army base. These tanks stored fuel oil and gasoline. It is not known whether they were emptied or removed when the Army closed the camp.

Site 22 covers a central portion of Beale AFB. Review of Camp Beale records indicated four significant areas in which underground tanks had been located. These areas, Hospital Area, C.A.S.C Troops Area, Corps Troops Area, and Armored Division, are indicated in Figure 4.1.22-1.

The Stage 2-1 investigation at Site 22 consisted of a review of Camp Beale records, locating areas believed to have buried tanks, and conducting a magnetic geophysical survey at selected locations. No soil, surface water or groundwater investigations were performed. Therefore, no discussion of site geology or hydrogeology is included for Site 22. Geologic and hydrologic conditions are discussed in sections addressing individual IRP sites within the Site 22 area.

A review of 1943 maps of Camp Beale indicated the following tanks were present at the camp:

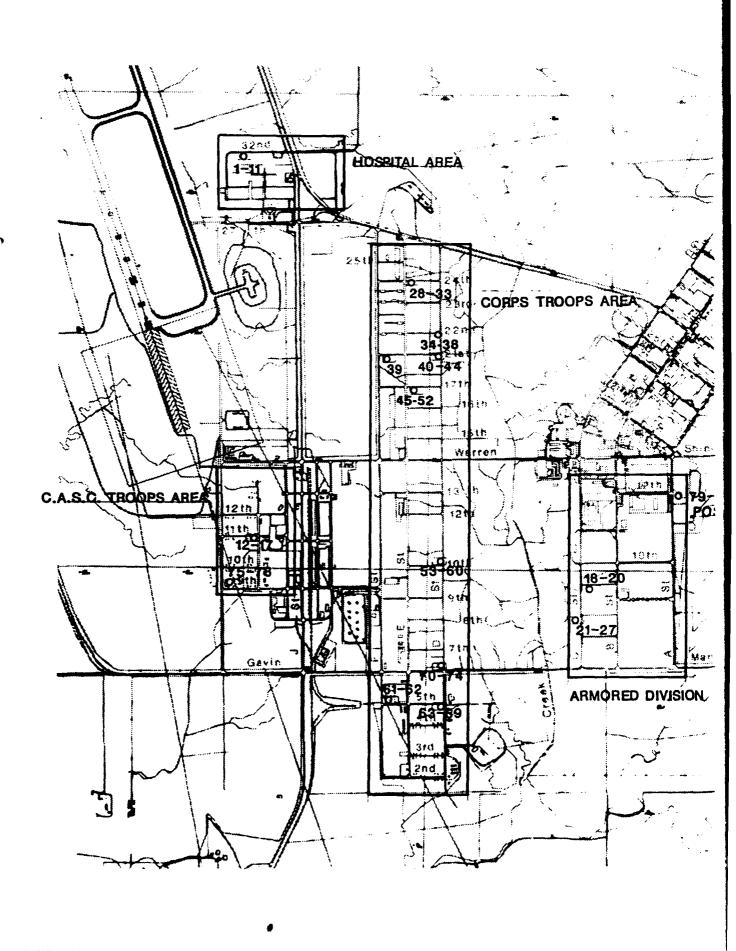
Gasoline Tanks

30 12,000 gallons 6 10,000 gallons 2 5.500 gallons 38 Gasoline Tanks

Fuel Oil Tanks

176	264	gallons	(Size	A)
10		gallons		
324		gallons		
194	1,150	gallons	(Size	E)
6	1,500	gallons	(Size	F)
1	2,500	gallons		
2	3,000	gallons		
1		gallons		
_1	12,000	gallons	(Size	<u>K)</u>
715	Fuel Oil 1	anks		

At the time of the Stage 2-1 study, the existence, condition, and contents of these tanks were not known. The

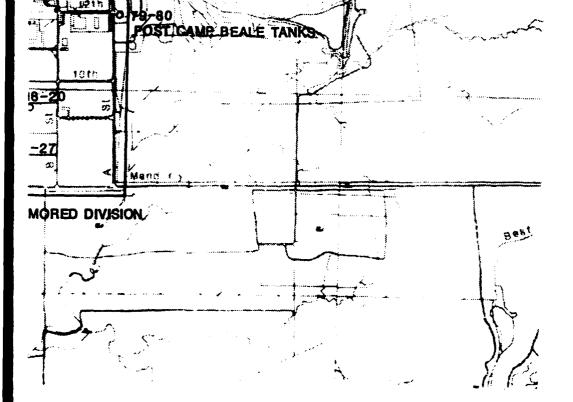


LEGEND

O NN-NN INDICATES TANK NUMI ASSIGNED DURING IRP STAGE :

NOTES:

- 1. 80 TANK LOCATIONS INVESTIGATE MAGNETOMETER.
- 2. BURIED METAL WAS DETECTED AT LOCATIONS.
- 3. POSSIBLE BURIED METAL WAS DE 8 LOCATIONS.
- 4. NO BURIED METAL WAS DETECTED LOCATIONS.
- 5. BURIED TANK LOCATIONS NUMBER WERE DETERMINED FROM CAMP E DATED 1944.



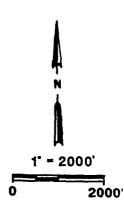


FIGURE 4.1.22-1
SITE 22: ABANDONED UNDERGROUND STORAG

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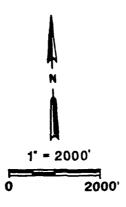
4-491

LEGEND

O NN-NN INDICATES TANK NUMBERS 1 TO 80 ASSIGNED DURING IRP STAGE 2-1 STUDY

NOTES:

- 1. 80 TANK LOCATIONS INVESTIGATED WITH MAGNETOMETER.
- 2. BURIED METAL WAS DETECTED AT 47 LOCATIONS.
- 3. POSSIBLE BURIED METAL WAS DETECTED AT 8 LOCATIONS.
- 4. NO BURIED METAL WAS DETECTED AT 25 LOCATIONS.
- 5. BURIED TANK LOCATIONS NUMBERED 1 TO 78 WERE DETERMINED FROM CAMP BEALE PLANS DATED 1944.



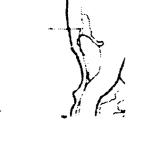


FIGURE 4.1.22-1
SITE 22: ABANDONED UNDERGROUND STORAGE TANKS

-CHEM HILL-

objective of the work done at Site 22 was to evaluate a "representative" 10 percent of the tank sites. In choosing representative tanks, the following criteria were used:

- o Consider accessible tanks only. Tanks shown to be underlying existing buildings or roads were not considered.
- o Evaluate approximately 10 percent of the tanks of each size.
- o Study the influence of reinforced concrete foundations, roads, telephone lines, and fences on magnetometer readings. Some tanks near objects that might affect magnetometer readings were selected to determine if these objects affected results.
- o Review other tank maps and consider notes on the maps when evaluating tank sites for magnetometer survey. A set of 1944 Camp Beale maps included comments about facility changes, Air Force job numbers, and construction dates pertaining to work done as the base was changed from an Army to an Air Force base.

The sizes and number of tanks shown in the 1943 maps and the 1944 maps differ. The tank totals listed above, compiled from the 1943 maps, indicate 194 tanks of 1,150-gallon. However, the 1944 maps show no tanks of that size. Also the 1943 maps show only 10 tanks of 420 gallons, whereas the 1944 maps show more 420-gallon tanks than any other tank size. These discrepancies probably reflect the difference between designed and as-built conditions, although this is not clearly indicated. Overall, the 1944 maps were judged to be the more reliable and were used throughout the investigation.

Figure 4.1.22-1 shows the areas evaluated and tank numbers assigned during the Stage 2-1 study. Locations are given on an individual tank basis in Table 4.1.22-1. In addition to tank locations, Table 4.1.22-1 includes a list of the 1944 indicated tank size, a brief site description and associated Camp Beale building number, whether metal was detected, reference to where the anomaly is located, and the 1944 Camp Beale sheet number associated with each tank location. The 1943 and 1944 Camp Beale maps are available at the Beale AFB Civil Engineering office.

TABLE 4.1.22-1 SITE 22: MAGNETIC GEOPHYSICS RESULTS

		COMMENTS CAMP BEALE MAP SHEET	NUMBER AND COMMENTS											HOSPITAL AREA	SHEET # 44	Hospital and troop housing	areas as shown on sheets	44, 45, 64 & 65 were re-	habilitated under Job No.	Camp Beale 51-M and O-AF	Contract eng. 556,	completed January 1952.							Weak. SHEET #51	sevil Jewood to sevilled on												0-15N Other magnetic sources.
		8	ATION			Z S		80		108		•			\$5		•	•	108		દુ		Z				•	П	ž				<u> </u>		<u> </u>		•				N-1-0	
		GRID LOC-	LINE			10E		≱ 6		20₩		•			5		ĐĐ		•		- J		¥0£				30E		•								10E				0	
		METAL	DETECTION			YES		YES		YES		YES			YES		YES		YES		YES		YES		9		YES		UNCERTAIN		MATOSOM.	CACERIAN		MACCOTAIN			YES	}			UNCERTAIN	
		SITE DESCRIPTION	CAMP BEALE BUILDING NUMBER DETECTION LINE ATION			End of driveway, undisturbed.	T-2580	Undisturbed	T-2549	Undisturbed	1-2561	Undisturbed w/ asphalt chunks	covering eite.	T-2661	Undisturbed	T-2546	Undisturbed	T-2648, T-2550	Undisturbed	T-2558, T-2580	Undisturbed	T-2568	Undisturbed	1-2400	Edge of aephalt	1-2533	Edge of asphalt	T-2533	Grid oriented N45E,	depression at tank focation.		Berween roundations,	disturbed surface.	1-11/2, 1-11/4	Foundation weet, distuibed	eurlace.	Between frankations	disturbed surface	valve in Nilicorper	T-1147, T-1149	Foundation west, disturbed	
TANK LOCATIONS	N-S Street	Distance	(loot) east	or west of	Street edge	420 E of M St		185 E O M SS		275 E of M St		428 E of J St			100 E of M St		190 E of M St		185 W of J St		107 E of J St		402 E of J St		10 E of sephalt	between J & M	6 W of asphalt	between J & M	BO W of K St			TEA WOME		2	70 M 50 M 609		28 W 20 W 28				35 W of M St	
TANK	E-W Street	Distance	(feet) north	or south of	Street edge	175 8 of 32th		125 N of 31st		125 N of 31st		145 N of 31st			122 S of 31st		106 S of 31st		85 S of 31st		85 S of 31st		130 N of 31st		60 N of 29th		45 N of 29th		90 N of 12th			20 N OZ 02 13 15 15 15 15 15 15 15 15 15 15 15 15 15			E LO NOS		50 S of 11th	5			50 S of 11th	
		TYPE	CAPACITY	(Dellon)		B/420		8		900		900			8		750		750		300		900		0001		8/420		K/12000			200 200 200 200			24.20		0,800	}			B/420	
		TANK	Œ			C-T-1		C-1-2		C-1-3		C-17			C-1-6		C-1-0		C-T-7		\$-1-0		C-T-0		C-1-10		C-T-11		C-T-12			C-T-13		;	-1-1-5 		A. T	2			C-T-10	

TABLE 4.1.22-1 SITE 22: MALI, LTIC GEOPHYSICS RESULTS (Continued)

Type E-W Steek Diseases			TANK	OCATIONS						
Cutation			:	N-S Street						
Cutton C	TANK	TYPE/	Distance	Distance	SITE DESCRIPTION		GRID	မွ	COMMENTS	CAMP BEALE MAP SHEET
Greek edge Gre		CAPACITY	(feet) north	(feet) east	CAMP BEALE BUILDING NUMBER	DETECTION	LINE	ATION		NUMBER AND COMMENTS
Street adgress Stre		(aellon)	or south of	Or west of						
C1580 40 8 of 8h 100 E of C S Even suiteach Fees autieach Fees Fees suiteach Fees			Street edge	Street edge						
Hardoo 20 6 of et al. 10 E of C 8 T-4253, T-2256 HO Some metal may be present.	C-T-18	C/580	40 S of 9th	100 E of C St	Even surface w/ coarse gravel.	YES	0	98		
B420 96 5 d 8h 320 E of C 8l Few, hasturises surface. NO 75 Soft and metal may be present. Conf. Transcription of the present. NO A754 206 6 d 8h 110 E of C 8l Chambed surface. NO Transcription of the present. NO A754 206 8 d 8h 110 E of C 8l Conf. Transcription of the present. NO A754					T-6253, T-6255					
AZEM 206 6 of the 110 E of C St Checke 1-4254 1-425	C-T-19	B/420	95 S of 9th	320 E of C St	Even, featureless surface.	Ş			Some metal may be present.	
MAZE4 205 8 of 8th 110 E of C SI Chiefle bed surfaces. MO 158 1-46251					T-6259, T-6263					
European Control of the control	C-1-20	N264	205 S of 9th	110 E of C St	Disturbed surface.	Ş				
But 20 100 N of 8th 80 W of CS Few depression (9 15 8. 755 20W 155 150 N of 8th 100 E of CS Disch (9 20 8. 755 C of 8th 100 E of CS Concrese building wee. NO 1-4252 1-42					T-6251					
C/550 40 N of 8th 100 E of C St District #0.30 S. F. NO SNP Consideration and supplied to the state of the state o	C-T-21	B/420	100 N OF	ない で ※ の の の の の の の の の の の の の	E-W depression @ 15 S.	YES	≱	200		SHEET # 142
E4420 20 N of 8th 320 E of C St Concession where building was. NO S of 8th 20 E of C St Concession where building was. NO S of 8th 20 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression where building was. NO S of 8th 320 E of C St Depression at N-S, 20w Depression at	C-1-22	C/580	40 N of 8th	100 E of C St	Ditch @ 30 S.	YES	•	5N3		Concrete foundations only.
Bit 20 60 N of 6th 320 E of C St Concrete enable @ 30 S S E. NO Some metal may be present. Ci550 40 S of 8th 60 W of C St Depression where building wes. NO 9 Sone metal may be present. Ci550 40 S of 8th 40 E of C St Depression where building wes. NO 9 Sone metal may be present. T-4136 T-4136 T-4136 NO NO Weak. Li200 225 N d 24th 110 E of C St Fewn earliers. NO NO Ci550 60 N of 24th 100 E of C St Fewn earliers. NO Sone Size. Ci550 60 N of 24th 100 E of C St T-4778 NO Sone Size. Ci550 60 N of 24th 100 E of E St The M inside Web 30S. YES 10W So Size. Ci550 60 S of 24th 100 E of E St The M inside Web 30S. YES 10W So Size. Con Ci550 60 S of 24th 100 E of E St The M inside Web 30S. YES 10W So Size. Con Ci550 <td< th=""><th></th><th></th><th></th><th></th><th>T-6252, T-6254</th><th></th><th></th><th></th><th></th><th></th></td<>					T-6252, T-6254					
B420 76 S of Bth 80 E of C St Dispression where building was. NO Some metal may be present. C/550 40 S of Bth 30 E of C St Dispression where building was. YES 10W 0 Weak. A/264 30 S of Bth 120 E of C St Even earlies. NO YES 10W 0 Weak. A/264 205 S of Bth 110 E of C St Even earlies. NO No </th <th>C-T-23</th> <th>B/420</th> <th>90 N of 8th</th> <th>320 E of C St</th> <th>Concrete rubble @ 30 S 5 E.</th> <th>⊋</th> <th></th> <th></th> <th></th> <th></th>	C-T-23	B/420	90 N of 8th	320 E of C St	Concrete rubble @ 30 S 5 E.	⊋				
T-6136	C-T-24	8/420	75 S of 8th	80 W of C St	Depression where building was.	Ş			Some metal may be present.	
Cute		i			T-6138					
But 20 20 S of 8th 320 E of C St Even surface. NO 10 E of C St 10 E of C	C-T-25	C/580	40 S of 8th	BO E of C St	Disturbed w/several	YES	¥01		Woak.	
Higher 205 S of 8th 320 E of C St T-6236, T-6231 NO F-6236 T-6236 T-					depressions.					
M264 205 S of 8th 110 E of C SR Evera surface. NO 110 E of C SR Directived surface. NO 1-4226, T-4229 NO 1-4226, T-4229 NO 1-4226, T-4227 NO 1-4226, T-4227 NO 1-4226, T-4227 NO 1-4226, T-4227 NO 1-4226, T-4226 NO 1-4276					T-6229, T-6231	,	_			
1-6220, 1-6227	C-1-2	B/420	90 S Of 8th	320 E of C 98	Even surface.	<u> </u>		_		
M264 205 S of 8th 110 E of C 8th 100 E of E E				1	1-6235, 1-623 9	9	-			
CJSBO 60 N of 24th 100 E of E St PH w/ rebur @ 502 25E. NO Buried metal along line W. CJSBO 60 N of 24th 100 E of E St Disch @ 20N. T-4778. NO 5-20S Poetition uncertain. CJSBO 60 N of 24th 240 E of E St Concrete alab @ 30S. YES 10W 6S CJSBO 60 S of 24th 100 E of E St Concrete alab @ 30S. YES 10W 6S CJSBO 60 S of 24th 100 E of E St Concrete alab @ 30S. YES 10W 6S CJSBO 60 S of 24th 100 E of E St Several aidewalks within NO 5S Nosation uncertain. Con H/3000 226 S of 24th 105 E of E St Several aidewalks within NO SS Weak. May be farther weat. Con H/3000 226 S of 24th 105 E of E St Several aidewalks within NO SS Weak. May be farther weat. C/580 No N of 22th T-4780, T-4744 T-4742 T-4744 YES 10E SS Poetition along line C/580 No N	C-T-27	7 58	205 S of 8th	110 E of C S	Dieturbed surface. T-6226, T-6227	§				:
C/590 60 N of 24th 100 E of E St Ditch @ 5N. NO YES 0 5-20S Position uncertain. C/590 60 N of 24th 240 E of E St Ditch @ 2N. YES 10W 6S Concrete alab @ 20S. YES 10W 6S Position uncertain. Concrete alab @ 20S. YES 10W 6S Position uncertain. Concrete alab @ 20S. YES 10W 6S Position uncertain. Concrete alab @ 20S. YES 10W 6S Position uncertain. Concrete alab @ 20S. YES 10W 6S Position uncertain. Concrete alab @ 30S. YES 10W 6S Position uncertain. Concrete alab @ 30S. YES 10W 6S Position uncertain. Concrete alab @ 30S. YES 10W 6S Position uncertain. Concrete alab @ 30S. YES 10W SS Position along line Concrete alab @ 30S. YES 10W SS Weak. May be farther west. Concrete alab @ 30S. YES 10E SS Position along line C/580 40 N of 22nd 180 W of D	C-T-28	H/3000	225 N of 24th	105 E of E St	Pit w/ rebar @ 50S 25E.	Ş				
C/560 60 N of 24th 100 E of E St Ditch © 5N. NO Buried metal along line W. C/560 60 N of 24th 240 E of E St Ditch © 20N. YES 0 5-20S Position uncertain. C/560 60 S of 24th 240 E of E St Concrete stab © 30S. YES 10W 5S Concrete stab © 30S. YES 10W 5S Constitution uncertain. Concrete stab © 30S. YES 10W 5S Position uncertain. Concrete stab © 30S. YES 10W 5S Position uncertain. Concrete stab © 30S. YES 10W 5S Position uncertain. Concrete stab © 30S. YES 10W 5S Position uncertain. Concrete stab © 30S. YES 10W 5S Position uncertain. Concrete stab © 30S. YES 10W 5S Position uncertain. Concrete stab © 30S. YES 10F 5S Position along line W. Concrete stab © 30S. YES 10F 5S Position along line W. Concrete stab © 30S. YES 10F SS Position along line W. Concrete stab © 30S.					1-4776					
C/590 60 N of 24th 240 E of E St Dirth g 20N. YES 0 5-20S Poetition uncertain. C/590 60 S of 24th 100 E of E St Concrete etab @ 20N. YES 10W 6S C/590 60 S of 24th 240 E of E St Sidewalk @ 40N. YES 10W 6S L/3000 225 S of 24th 105 E of E St Sidewalk @ 40N. NO NO H/3000 225 S of 24th 105 E of E St Sidewalk @ 40N. NO NO H/3000 225 S of 24th 105 E of E St Sidewalk @ 40N. NO NO H/3000 225 S of 24th 105 E of E St Sidewalk @ 40N. NO NO H/3000 225 S of 24th 106 E of E St Sidewalk @ 40N. NO SS H/3000 208 N of 22nd 110 W of D St Even. undiductued aurlace. YES 10E SS C/580 40 N of 22nd 180 W of D St Uneven widepressions left YES 10E SS C/580 40 S of 22nd 180 W of D St	C-1-20	C/560	60 N of 24th	100 E of E St	Ditch @ SN.	ş			Buried metal along line W.	
C/550 60 B of 24th 240 E of E St Ditch @ 20N. YES 10W 6S Position uncertain. C/550 60 S of 24th 100 E of E St Concrete stab @ 30S. YES 10W 6S Con C/550 60 S of 24th 240 E of E St Sidewalk e 40N. YES 10W 6S Con C/550 225 S of 24th 105 E of E St Several aidewalks within NO N					T-4778, T-4780				:	
C/5s0 60 S of 24th 100 E of E St Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. YES 10W 6S Concrete elab © 30S. Concrete elab © 30S. <th>C-1-30</th> <th>9 50</th> <th>90 N of 24th</th> <th>240 E of E S</th> <th>DACH @ 20N.</th> <th>YES</th> <th></th> <th>5-20S</th> <th>Poeition uncertain.</th> <th>COHPS IMOOPS AREA</th>	C-1-30	9 50	90 N of 24th	240 E of E S	DACH @ 20N.	YES		5-20S	Poeition uncertain.	COHPS IMOOPS AREA
C/560 60 S of 24th 240 E of E St Sidewalk @ 40N. 1-4757 H/3000 225 S of 24th 105 E of E St Several aidewalk @ 40N. 1-4757 H/3000 225 S of 24th 105 E of E St Several aidewalk @ 40N. 1-4750, T-4751 H/3000 208 N of 22nd 110 W of D St Bepression at N-S, 20w. 1-4748 C/580 40 N of 22nd 180 W of D St Bebressions left YES 10E SS Poeition along line Construction T-4746 C/580 40 S of 22nd 180 W of D St Bebressions left YES 10E O SS Disturbed aurtace. C/580 40 S of 22nd 180 W of D St Bebressions left YES 10E O SS Disturbed aurtace. 1-4746 C/580 40 S of 22nd 180 W of D St Bebressions left YES 10E O SS Disturbed aurtace. 1-4746 C/580 40 S of 22nd 180 W of D St Bebressions left YES 10E O SS Disturbed aurtace. 1-4710		-	400	S 11 000	906 6 441		3	ď		Concrete foundations only
C/560 60 S of 24th 240 E of E St Sidewalk @ 40N. YES 10W 6S H/3000 226 S of 24th 106 E of E St Several sidewalks within NO <	7	3	5000	5 4 5 4	T-4753, T-4756		-			
H/3000 225 S of 24th 105 E of E St Several eideweiks within NO 225 S of 24th 105 E of E St Several eideweiks within NO 225 S of 24th 105 E of E St Several eideweiks within NO T-4750, T-4751 T-4750, T-4751 T-4748 T-4748 T-4742 T-4744 T-4742, T-4744 T-4742, T-4744 T-4742, T-4746 T-4747, T-4719 T-4717, T-4719	C-T-32	0,000	60 S of 24th	240 E of E St	Sidewalk @ 40N.	YES	¥01	28		
H/3000 226 S of 24th 105 E of E St Several aidewalks within NO NO Several aidewalks within NO CISS Meat. May be farther weat. CISS Meat. May be farther weat. CISS Meat. May be farther weat. Con C/580 40 N of 22nd 180 W of D St Even. undisturbed aurface. YES 10E 5S Poeition along line Con B/420 40 N of 22nd 35 W of D St Disturbed aurface. YES 0 5S Incertain. Con C/580 40 S of 22nd 180 W of D St Uneven w/ depressions left YES 10E 0 5S Incertain. Con C/580 40 S of 22nd 180 W of D St Uneven w/ depressions left YES 10E 0 5S Incertain. Con					T-4757					
T-4750, T-4751	C-1-33	H/3000	225 S of 24th	105 E of E St	Several aidewalks within	Ş				
H/3000 208 N of 22nd 110 W of D St Depression at N=S, 20w. UNCERTAIN 20W 5S Weak. May be farther weat. C/580 40 N of 22nd 180 W of D St Even, undisturbed surface. YES 10E 5S? Position along line B/420 40 N of 22nd 35 W of D St Disturbed surface. YES 0 5S T-474a T-474b YES 0 5S C/580 40 S of 22nd 180 W of D St Uneven w/ depressions left YES 10E 0 Dy buildings. T-4717, T-4719 T-4717, T-4719 T-4717, T-4719 T-4717, T-4719					grid, no effect on readings.					
C/550 40 N of 22nd 180 W of D St Even, undisturbed surface. C/550 40 N of 22nd 180 W of D St Even, undisturbed surface. C/550 40 N of 22nd 180 W of D St Disturbed surface. C/550 40 S of 22nd 180 W of D St Uneven w/ depressions left YES 10E 0 by buildings. T-4717, T-4719	,	000011	1 - 00 pt - 10 000	20 C TO THE CO.			300	9	West May be farther west	
C/560 40 N of 22nd 180 W of D St Even, undisturbed eurface. YES 10E 5S7 Position along line B/420 40 N of 22nd 35 W of D St Disturbed eurface. YES 0 5S uncertain. C/560 40 S of 22nd 180 W of D St Uneven w/ depressions left YES 10E 0 T-4717, T-4719 T-4717, T-4719 T-4717, T-4719 T-4717, T-4719 T-4717, T-4719	<u> </u>	2005	DUZZ IO N SOZ				*	3	Weak. May be tallief weak.	CORPS TROOPS AREA
B/420 40 N of 22nd 35 W of D St Dieturbed eurtace. YES 0 5S uncertain. T-4742, T-4744 YES 0 5S uncertain. T-4746 T-4746 Uncertain.	C-1-35	C/580	40 N of 22nd	180 W of D St	Even, undisturbed surface.	YES	10E		Position along line	SHEET # 87
B/420 40 N of 22nd 35 W of D St Disturbed eurtace. YES 0 T-4746 T-4746 T-4746 T-4746 T-4746 T-4746 T-4776 T-4777 T-4719 T-4717, T-4719 T-4717, T-4717, T-4719 T-4717, T-4717, T-4719 T-4717, T-4719 T-4717, T-4719 T-4717, T-4719 T-4717, T-4717, T-4719 T-4717, T-4717, T-4719 T-4717, T-4717, T-4719 T-4717, T-4717		•			T-4742, T-4744		•		uncertain.	Concrete foundations only.
C/560 40 S of 22nd 180 W of D St Uneven w/ depressions left YES 10E by buildings. T-4717, T-4719	C-T-36	B/420	40 N of 22nd	35 W of D St	Disturbed surface.	YES	•	9 2		
by buildings. T-4717, T-4719	r-1-1	08/0	40 S of 22nd	180 W of D S	Uneven w/ depressions left	YES	10F	٥		
T-4717, T-4719	ر ا	3	00000	5	by buildings.	3	1	•		
					T-4717, T-4719					

TABLE 4.1.22-1 SITE 22: MAGNETIC GEOPHYSICS RESULTS (Continued)

		- i		(Continued)					
		¥ĺ	LOCATIONS						
		E-W Street	N-S Street						
TANK	TYPE	Distance	Distance	SITE DESCRIPTION	METAL	GRID LOC-	-507	COMMENTS	CAMP BEALE MAP SHEET
NUMBER	CAPACITY	(leet) north	(feet) east	CAMP BEALE BUILDING NUMBER DETECTION LINE ATION	DETECTION	LINE	ATION		NUMBER AND COMMENTS
	(notten)	or south of	or west of						
		Street edge	Street edge						
S-1-0	BV420	40 S of 22nd	36 W of D St	Sidewalk @ 30S.	YES	흥	0		
				T-4721					
C-1-30	K/12000	80 S of 21st	BO E OF SE	Lines oriented N45E;	YES	10SE	98 M		CORPS TROOPS AREA
				depression at tank location.					SHEET# 67
				T-4396					Concrete foundations only.
C-T-40	C/580	80 N of 21st	176 W of D St	Sidewalk @ 40S, 0E-W.	YES	•	0		
				Rebar at 25S, 20E.					
				T-4718 T-4718					
17.4	0,430	100000	8 2 7 7 7 7 8	Sidemak & 10E	Ş				
•	23.40	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5 5 6 6	County of 10E.	}				
				Hebar at Zon, 5W.					
				14720					
C-T-42	C/580	60 S of 21st	176 W of D St	Relatively even, depressions	YES	0	Ž		
				to both east and west.					
				T-4493 T-4495					
C-1-43	B/420	AD S. of 21st	S W S D S	Shallow decreasing aidemalk	× 2 2	30	-	Position uncertain	
			5		2	:	,		
				atong 10 E.					
				1-4407					
C-1-4	N264	225 S of 21st	111 W of D SR	Even, disturbed area to NW.	ş			Some metal may be present.	
				1-4400					
C-T-45	N264	225 N of 17th	105 E of E St	Even eurface, disch @ 25N.	Q.				
				T-4478					
C-T-46	C/580	40 N of 17th	SE OF SE	Disturbed eurface, concrete	ş				
				Ded at 15S. 0E.					
				T-4478, T-4480					
C T. 63	B/420	46.52	240 F OF G	demelle	INCEDIAM	_	•	100%	-
,	2		5			,	•		COBBE TBOODS ABEA
7 - T	B/420	10K M of 17th	400 F of F S	First Birless W. e. fee	× E.S.	•	2		SHEET # BE
}			5		}	•	;		
				200 100 PM					Concient Controlled only.
				T 4400 T 4400					
1		•							
<u> </u>	3	E/1000		dewelke.	UNCENTAIN	•	•	WOEK.	
				1-4453, 1-4456					
8 -i-5	8/420		240 E Of E SE	Even surface w/eldewalks.	YES	<u>§</u>	<u>z</u>		
			1	T-4457					
C-T-5	A/264	225 S of 17th	105 E of E S	Uneven surface.	YES	•	•		
				T-4451, T-4450					
C-T-52	8/420	105 S of 17th	400 E of E St	Asphalt @ 0 N-S.	YES	20E	108		
				depression at 15E.					
				T-4463, T-4465					
C-T-53	C/280	200 N of 11th	148 E of D St	Open field, uneven eurface,	YES	§	158		CORPS TROOPS AREA
				Francis of John.					STEEL
1	0007/0	411.50 20 000	2000	Occupies consequently and	, C	3			Concrete foundations only
<u>ة</u> د	24/0	5	3000	T-4228	153	<u>*</u>	>		
		Ŧ				1		1	

TABLE 4.1.22-1 SITE 22: MAGNETIC GEOPHYSICS RESULTS

		CAMP BEALE MAP SHEET	NUMBER AND COMMENTS				CORPS TROOPS AREA	SHEET # 91	Concrete foundations only.																				A 30 COT 300 CO	CONTS INCOLS AND	Concrete foundations only.										
		COMMENTS						Some metal may be present.					Grid short due to nesting	hawk.			Some metal may be present.				Some metal may be present.		Same grid as C-T-61.		Other metal present.			Weak.				-	Position uncertain.								
		8	ATION		90,	3													155						0			108		900	3		•			Not			•		
		GRID	LINE						-										§						•			•		á	À		•			•	,		10E		
		METAL	DETECTION		VEC	2		¥	;	<u>Q</u>			ş				ş	i	YES		≩		Ş	!	YES			YES		0	3		YES			YES			YES		_
(Continued)		SITE DESCRIPTION	CAMP BEALE BUILDING NUMBER DETECTION LINE ATION			End of eidewalk @ 30S, 20W.	T-4210	Open field, even surface.	T-4206, T-4206	Open Beld, even surface,	with coarse gravel.	T-4204, T-4202	Open field w/ E-W feature	from 10S to 30S.	Hawk nest @ 20N.	T-4200	N-S sidewalk along 0 E-W.	1-3000	Open Reid.	2000	depressions at tank location	T-3496	Same as above.	T-3406	Disturbed surface, with	foundation rubble. Depression at 10N, 10W.	T-3508	Disturbed surface, with foundation rubble;	depression at grid center.	France author of stone	lined troughs at 20S.	T-3502	Depression at building	foundations, with a desper	depression at grid center. T-3594, T-3596	Uneven surface, foundation	rubble; recent excevation	NE excavation NE of grid.	Uneven surface, foundation	rubble; recent excavation	7-3507
	LOCATIONS	N-S Street Distance	(leef) east	or west of	and the same	5		166 E of D St		170 E of D SE			75 E of D St				33E of D SR		70 E of D SR	200	— 5		Same as above		136 W of D St			328 W of D St		25. W. C. S.			150 W of D St		-	328 W of D St			252 W of D St		
	×	E-W Street Distance	(feet) north	or south of	Section and a	500		165 S of 11th		100 N of 10th			3 N of 10th	•	•		118 S of 10th		186 S of 10th	100			Same as above		170 N of 5th			105 N of 5th		49 70 70	5	•	90 N of 56h			110 S of 5th			90 S of 5th		
		TYPE	CAPACITY	(molling)	00010			C/280		0 8 5/0			N264			•	8/420		9 3 3 3 3	3000	3		K/12000		N264			B/420		000	2		08 ()			B/420	<u> </u>		B/420		
		TANK	NUMBER		2 4 6	3		C-T-5		C-T-57			C-T-5				C-T-56		2		F .		C-T-82		C-T-8			\$ 1-5		3	3		2 -1 -5 -1 -5			C-1-67			C-T-0		

TABLE 4.1.22-1 SITE 22: MAGNETIC GEOPHYSICS RESULTS (Continued)

			CAMP BEALE MAP SHEET	NUMBER AND COMMENTS			CORPS TROOPS AREA	SHEET # 94	Concrete foundations only.							COHPS THOOPS ANEA	SHEET # 93	Concrete foundations only.												C.A.S.C. TROOPS AREA	SHEET #52	No buildings or power lines	concrete foundations and	underground utilities	remain.							Poet-Camp Beale abandoned	. Jest			
			COMMENTS																	Weak, Position uncertain.								Weak. May be farther west.							Anomaly probably related	to foundation.			Some and and and	Some metal may be present.	Only one line was run.	Source of anomaly is from	about 5 to 30 feet south of	fill can	Seman as a bost	Same as above.
			GRID LOC-	ATION									3				Z S			20	;							89			155						_									
			GHB	LINE									101	!			•			۰	,							10W			•															
			METAL	DETECTION			£			ş			YES				YES			YES) !				9			UNCERTAIN 10W			YES				2				Ş	2	YES				X ES	7
(Continued)			SITE DESCRIPTION	CAMP BEALE BUILDING NUMBER DETECTION LINE ATION			Uneven surface, foundations	T-3573, T-3572		Slightly disturbed, several	depressions.	T-3810, T-3814	Free entless shallow	describe alone 100	depression atom for.	1-3661	Even surface, E-W ridge	et 158.	T~3503	Even surface, filled	E-W description between	E-W depression between	10S and 10N.	T-3506, T-3507	Even surface w/ some	concrete rubble.	T-3500	Undiaturbed field.	foundation at SE corner.	T-770	Foundation 40 to east and	west; small depression from	30S to 10 S along 0E.	T-1102, T-1104	Foundation along 10W from 0S	to 10N; shallow depression	in center.	T-1106	Foundations to see the part man	T-1108, T-1110	Undisturbed, w/filler pipe at	tank location.			Same as above	
	TANK LOCATIONS	N-S Street	Distance	(leed) east	or west of	Street edge	115 W of D St			325 W of D St			SO W YOU				246 W of D St			103 W of D St					125 W of D St			70 W Of N SK			100 E of N St				240 E of N St				200 E A M G	5 E	82 W of A St				Same as above	- 11
	TANK	E-W Street	Distance	(leet) north	or south of	Street edge	225 S of 5th			106 N of 985			105 B of Oth				60 S of 6th			60 S of 6th					166 S of 6th			418 S of 9th			SON OF SEP				50 N of 9th				40 % 000	5	197 8 of 12th				Seme se shows	Outre de acces
			TYPE	CAPACITY	(pallon)		192N			8/420			77577				8/420			C/580					A/264			B/420			C/580				B/420				07770	3	1712000				K/13000	77 16 000
			TANK	NUMBER			C-1-80			C-T-20			C-1-71				C-T-72			C-T-73					C-T-74			C-T-76			C-T-76				C-T-77						C-T-70				7.7	

4.1.22.1 Presentation of Results

The presentation of results for Site 22 is restricted to the geophysical investigation. The total area encompassed by Site 22 includes IRP Sites 3, 9, 12, 14, 18, 19, 23, and 24.

Four areas within Site 22 were selected for investigation. The number of tanks located in each area in Figure 4.1.22-1 are listed below:

- ll tanks Hospital Area
- 10 tanks C.A.S.C. Troops Area 49 tanks Corps Troops Area
- 10 tanks Armored Division (includes two post-Camp Beale tanks)
- 80 tanks total

The results of the abandoned underground tank investigation at Site 22 are presented in Table 4.1.22-1. All of the tanks potentially detected in the magnetometer survey, according to size are given in Table 4.1.22-2 (top of next page).

Tanks C-T-79 and C-T-80 are referred to as post-Camp Beale abandoned tanks. These are gasoline tanks located along A Street. The filler pipe for the tanks is evident at the location specified in Table 4.1.22-1. Two other abandoned gasoline tanks were removed from the excavation for the foundation of the Burger King near the intersection of 24th Street and A Street when this building was constructed in 1987. Several other gasoline tanks are located along A Street and are currently being used.

Table 4.1.22-1 also lists the line in the grid established for this study along which the largest anomaly was located. A plot of the anomaly along that line for each tank is included in Appendix H. An explanation of how the grid was established at each tank location is presented in Section 3.4.1.

4.1.22.2 Sampling or Analytical Problems

No sampling or analyses were conducted for the Site 22 investigations.

Table 4.1.22-2
LIST OF RESULTS FOR GEOPHYSICAL INVESTIGATION

Number of Tanks	Tank Capacity and Size	Results
6	300 gallon	6 detected
2	750 gallon	2 detected
10	264 gallon (Size A)	3 detected
29	420 gallon (Size B)	16 detected 4 uncertain
22	580 gallon (Size 3)	16 detected 2 uncertain
1	1,000 gallon (Size D)	0 detected
1	1,150 gallon (Size E)	1 detected
3	3,000 gallon (Size H)	0 detected 1 uncertain
6	12,000 gallon (Size K)	3 detected <u>l uncertain</u>
80		47 detected 8 uncertain 25 not detected

4.1.22.3 Significance of Findings

The findings of the abandoned underground tank investigation are summarized in Table 4.1.22-2. Of the 80 sites investigated, 55 (69 percent) yielded results indicating buried metal may be present. Of this number, 8 (10 percent) had some level of uncertainty, usually associated with a weak anomaly. Therefore only 25 (31 percent) of the sites yielded a definite negative response. These results indicate that a large number of the tanks from Camp Beale may still be buried at Beale AFB.

Generally there were no consistent features evident in locations with positive magnetic anomalies. Often the ground surface was disturbed where an anomaly was detected, but frequently the ground was undisturbed. Conversely, at some locations, the ground surface was disturbed where an anomaly was absent, suggesting that a tank may have been removed. However some anomalies were detected in disturbed areas.

One possible explanation for the apparent randomness in buried metal detection is the manner in which the Air Force "auctioned" buildings when taking over the base. Buildings that were to be razed were auctioned off. The buyer may have demolished the building and removed the associated fuel oil tank or may have razed the building and left the tank. No detailed records of demolition during the base transition were encountered during the Stage 2-1 study.

Part of this investigation was to examine the effects of foundations, telephone wires, and roads on the magnetometer. In most areas, foundations appeared to have a minimal effect, except within 5 feet of reinforcing steel embedded in concrete. However, anomalies did exist on sites close to foundations in C.A.S.C. Troops Areas. Throughout the area, the magnetometer readings were consistently lower than at other locations on base. These lower readings may have been caused by a local anomaly rather than the foundations. No significant effects were observed in the vicinity of roads, telephone wires, or fences.

The only other factors that appeared to significantly affect the method were buried pipes. Comparison of locations of detected magnetic anomalies with the 1944 Camp Beale maps and with modern utility plans may discern when an anomaly could be attributed to a buried pipe rather than a buried tank. This effort was not undertaken during the Stage 2-1 study.

During June 1989, Beale AFB excavated possible underground storage tanks as presented in the initial draft of this report. Excavations were conducted at the following locations of positive metal detection: building (tank number) T-4482, T-4228, and T-4210 (CT-55); T-3986 and T-3565 (CT-67); and T-3593 (CT-71). Beale AFB personnel reported no underground storage tanks. However, at the six excavations, three pipes were found leading from the UST location at a depth of about 18 to 24 inches. These were assumed to be the fill pipe and fuel and return lines. There was physical evidence that these buried pipes had been sawn off.

It appeared the six tanks "potholed" for by Beale AFB in 1989 may have been removed and the areas filled with brick, broken concrete pipe, and other building debris. The excavation site at building T-4482 (CT-55) also revealed an extensive underground concrete foundation reinforced with rebar. Buildings T-4210 (CT-55) and T-3986 (CT-67) also had some remaining concrete foundations with rebar.

In 1990, Beale AFB removed 21 post Camp Beale tanks from the armored division area south of Warren Shingle Boulevard (Figure 4.1.22-1) prior to construction of a navigation school. The 21 removed tanks range in size from 150 to 10,000 gallons, and soil cleanup was achieved along with the tank removals. These tanks had been installed in the 1950s during conversion of Camp Beale to Beale AFB.

Conclusions about the presence of buried tanks at the surveyed sites cannot be based solely on the geophysical magnetic survey data. A further potholing excavation program is required to ascertain whether a tank is associated with each magnetic anomaly. The location of each magnetic anomaly grid center and the line within the grid with the peak magnetometer reading are presented in Table 4.1.22-1. A plot of each peak anomaly line is included in Appendix H. However, due to the inclination of the earth's magnetic field in the Beale AFB vicinity, the source location may not correspond exactly with the peak intensity location. It is necessary to split the distance between the relative high and low magnetic peaks and begin digging at this point.

There was some element of error in locating these tank sites, as it was done with a fiberglass tape and a standard compass and based on 45-year-old maps. It is recommended that a magnetometer be used during any follow-up investigation to more precisely locate the anomaly before potholing.

4.1.22.2 Contaminant Migration

No contaminant migration studies were conducted specifically for Site 22 during Stage 2-1.

4.1.22.3 Baseline Risk Assessment

No risk assessment activities were performed during the Stage 2-1.

4.1.23 DISCUSSION OF RESULTS FOR SITE 23: NINTH TRANSPORTATION REFUELING/MAINTENANCE SHOP

The transportation shop is located east of B Street between Warren Shingle Boulevard and Doolittle Drive. The site was used as a repair shop for fuel tank trucks. The site is mostly paved and has a large repair shop. An oil/water separator is present next to the shop.

The transportation shop has not been previously included in the IRP process at the base. Initial sampling has been completed to determine if contamination exists.

4.1.23.1 Presentation of Results

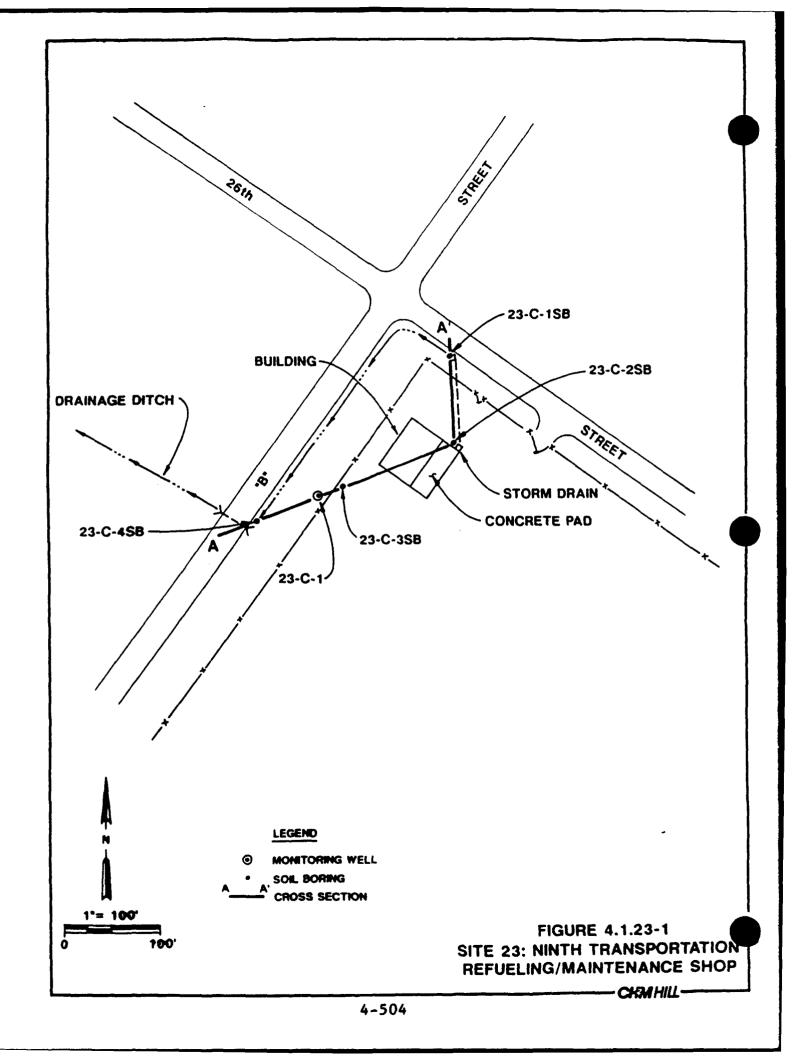
The following section presents the results of the field investigation at Site 23. The discussion focuses on the geology and hydrogeology at the site, and presents the results of chemical analyses performed on groundwater and soil samples.

4.1.23.1.1 Site Geology

Evaluation of the geology at Site 23 is based on a borehole drilled during the current Stage 2-1 investigation and completed as a monitoring well, and on four shallow soil borings. The well was drilled to a total depth of 79 feet (49 feet NGVD), and screened across the uppermost permeable zone at a depth of 45-65 feet BGS (63 to 83 feet NGVD). The boreholes were vertical borings drilled to a total depth below ground surface of 21.5 feet. The locations of the well and soil borings are shown on Figure 4.1.23-1. Soil boring logs are provided in Appendix D.

Soils beneath Site 23 consist primarily of brown sandy silts with some clay, as noted in the soil boring logs. These fine-grained materials appear to have a low permeability. The gravel at the top of boring 23-C-2SB is probably a coarse aggregate base laid down prior to construction of the concrete surface. At the south end of the site, sandy clays and sands occurred with the sandy silt. Below 20 feet BGS (108 feet NVGD), interbedded clays, sands, and gravels were encountered in monitoring well 23-C-1 with indurated claystone and sandstone occurring deeper than 60 feet BGS (68 feet NGVD). The consolidated materials became increasingly dense and competent with depth.

Surface materials at Site 23 are alluvial in origin and have been mapped as Victor Formation (Page, 1980). These mainly



fine-grained, highly variable deposits are stream channel and overbank materials laid down in the Pleistocene Epoch. The dark gray sandstones at the bottom of well 23-C-1 may belong to the volcanic rocks from the Sierra Nevada, a unit that dates from the Pliocene and Eocene Epochs.

4.1.23.1.2 Site Hydrogeology

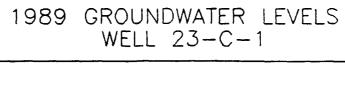
Site 23 is underlain by low permeability materials which likely retard infiltration of water through the unsaturated zone down to groundwater. Groundwater was first encountered during well drilling at a depth of 53 feet (75 feet NGVD) in a well-graded sand below a lean clay. The sand, which quickly graded to a sandy clay, yielded water to nearly the 60-foot depth (68 feet NGVD), as the borehole contacted the top of the consolidated rocks. Below this depth, the well-indurated claystone and sandstone produced very little water. After construction and development of the well the water level stabilized at about 47 feet below the ground surface (81 feet NGVD).

Groundwater levels measured in well 23-C-1 during 1989 are presented in Table 4.1.23-1 and Figure 4.1.23-2. A complete summary of groundwater level measurements, including elevations and depths to water, is provided in Appendix G. These measurements indicate that groundwater levels changed very little in this well during 1989. This pattern was typical of wells constructed on the eastern side of Beale AFB.

Table 4.1.23-1 GROUNDWATER ELEVATIONS: SITE 23 (feet NGVD)

Well	Screened Interval	February	March 1989	May 1989	August 1989	November 1989
23-C-1	65-45	81.51	81.19	81.67	81.91	81.98

Figure 4.1.23-3 presents a groundwater elevation contour map based on data from wells in the southern portion of Beale AFB collected in May 1989. Plates 3 and 4 show contours from similar data collected base-wide in March and November 1989. These figures show that groundwater in the vicinity of Site 23 is flowing to the southwest under the influence of the groundwater depression located immediately west of Beale AFB. Based on Figure 4.1.23-3, the horizontal groundwater gradient in the uppermost permeable zone of the



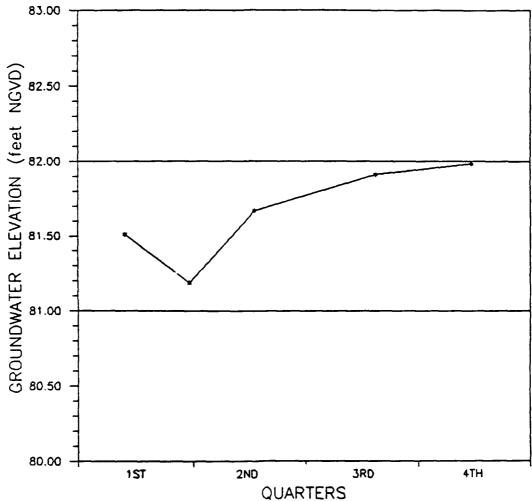
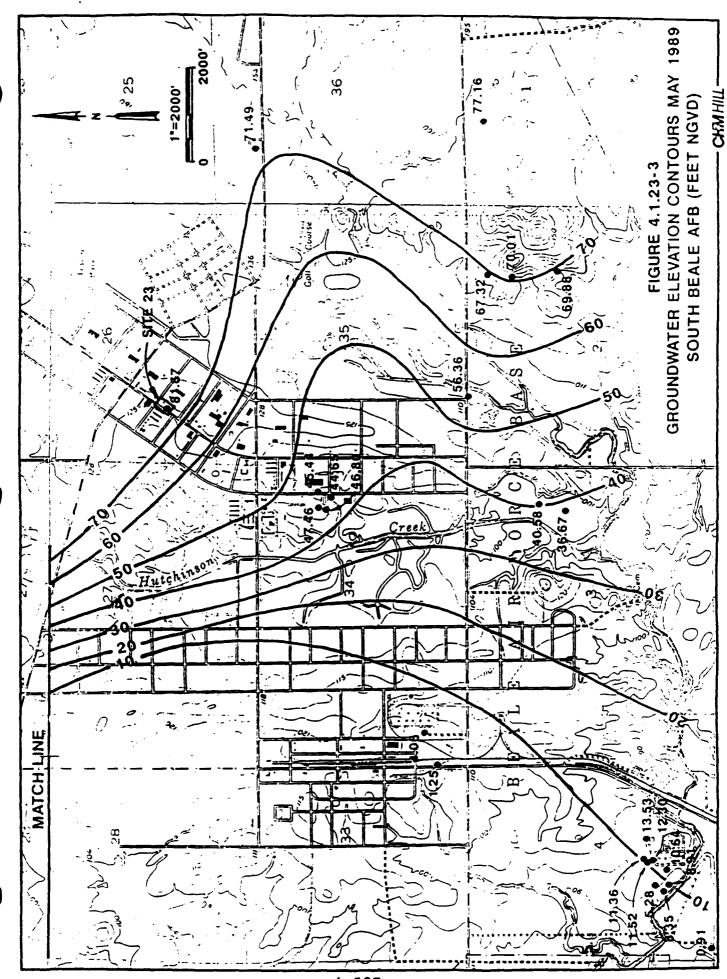


FIGURE 4.1.23-2
MONITORING WELL HYDROGRAP
SITE 23: NINTH TRANSPORTATION
REFUELING/MAINTENANCE SHOP

CHMHILL-



4~507

aquifer in the vicinity of Site 23 is approximately 10 feet per 1,000 feet, or 0.01. This relatively high gradient is typical in the eastern part of Beale AFB near the foothills. Well 23-C-1 was slug-tested to derive aquifer parameters because of the low permeability of the geologic materials and the low available drawdown. Data were analyzed according to the Bouwer-Rice method (1976). A discussion of aquifer testing methodology and plots of the data are provided in Appendix E. Based on the results of the analysis, the average value derived for transmissivity was 33 square feet per day, while the average value derived for hydraulic conductivity was 1.9 feet per day (6.7 x 10⁴ cm/sec).

Groundwater velocity may be estimated by substituting into Darcy's Law. Using a hydraulic conductivity of 1.9 feet per day, a hydraulic gradient of 0.01, and an estimated effective porosity of 0.20, the approximate groundwater velocity is 0.10 feet per day, or 35 feet per year. However, the velocity of groundwater flow through fractures may vary considerably.

The 72-hour pump test conducted in well 19-C-4 was performed in different geologic materials. However, if the hydraulic conductivity value of 28 feet per day is substituted into Darcy's law, the resulting groundwater velocity becomes 1.4 feet per day, or 510 feet per year.

4.1.23.1.3 Analytical Results

The following discussion of analytical results summarizes information contained in Appendix A. Associated quality control results are given with Appendix A and in Appendix F. Discussion of analytical results in this and following subsections, and presentation of analytical results in figures and tables, are limited to results that are indicators of site-specific contamination. Not all analytes are individually discussed or illustrated, but all analytes are presented in the Analytical Results Table in Section 4.1.23.1.4 and in Appendix A.

Twenty-one soil boring samples were collected at Site 23 from four 20-foot soil borings. These soil samples were analyzed for volatile organics (8240), ICP metals (6010), soil moisture (ASTM D2216) and TFH-diesel and -gas (California method).

Groundwater samples were collected from monitoring well 23-C-1 during the first and fourth quarterly sampling rounds. Analysis performed for the groundwater samples were

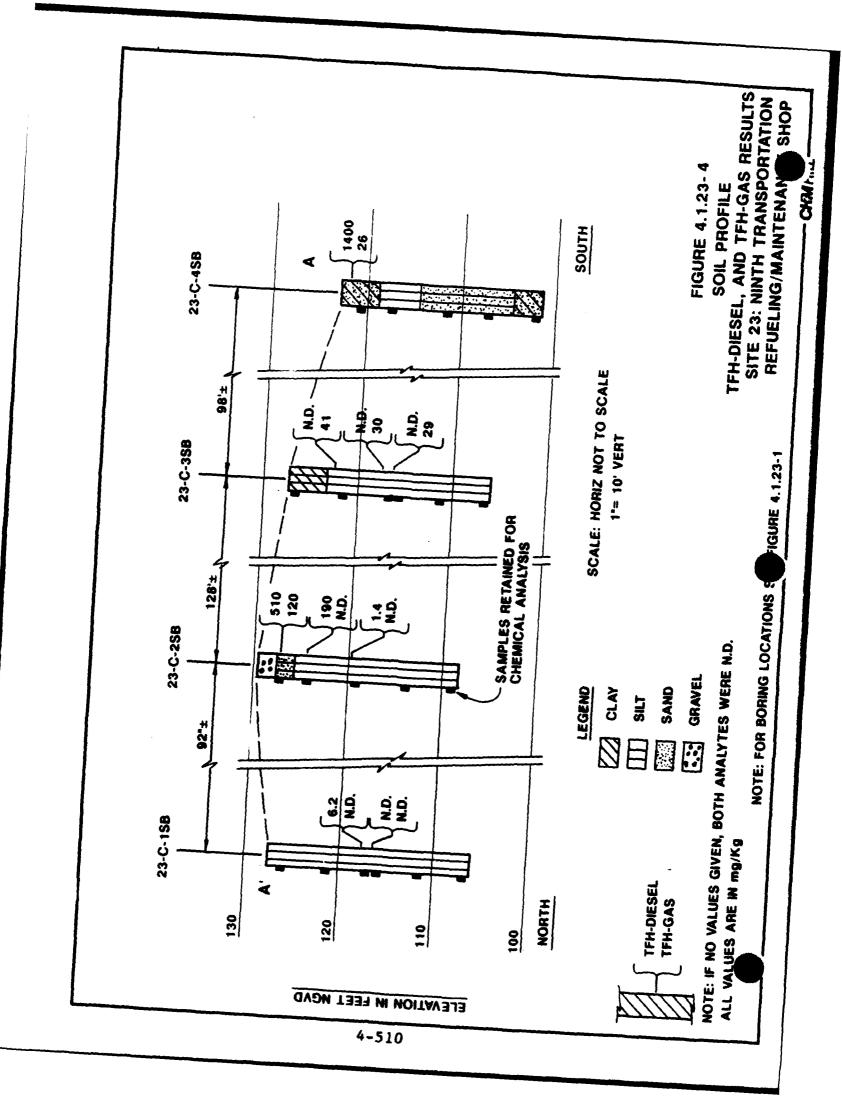
purgeable aromatics (8020), ICP metals (6010), lead (7421), water quality parameters, and TFH-diesel and -gas.

In this investigation toluene was detected in 20 soil boring samples at up to 1.1 mg/kg. 2-butanone was detected in seven samples at up to 0.20 mg/kg. In 23-C-2SB, ethylbenzene and total xylenes were detected in the 2.4 to 4-foot sample both at 0.005 mg/kg, in the 5-foot sample at 0.96 and 1.0 mg/kg, and in the 11.5- to 13-foot sample (field replicate for 10- to 11.5-foot) at 0.018 and 0.020 mg/kg. They were estimated below the LOQ at 10 feet.

At boring 23-C-2SB, lead was detected in the 2.4- to 4-foot sample at 38.4 mg/kg. Other metals were at similar levels to background soil values at Beale AFB. TFH-diesel was detected at 6.2 mg/kg in the 10-foot sample at 23-C-1SB (Figure 4.1.23-4). TFH-diesel was detected in boring 23-C-2SB in the 2.4- to 4-foot sample at 510 mg/kg, 190 mg/kg at 5 feet, and 1.4 mg/kg at 10 feet. TFH-gas was detected at 120 mg/kg in the 2.4- to 4-foot sample at 23-C-2SB. In 23-C-3SB, TFH-gas was detected at 41 mg/kg at 5 feet and 30 mg/kg at 10 feet. In 23-C-4SB, TFH-diesel was 1,400 mg/kg and TFH-gas was 26 mg/kg at 1 foot.

Toluene was detected at 2 ug/l (3 ug/l in second column) in the first quarter 23-C-l groundwater sample and 2 ug/l (1 ug/l in second column) in a replicate, but toluene was not detected in the equipment wash blank or ambient condition blank. TFH-gas was detected at 0.30 mg/l and at 0.70 mg/l in a replicate. However, TFH-gas was also detected at 0.80 mg/l in the equipment wash blank. TFH-diesel and lead were not detected. TDS were 359 and 349 mg/l. Major anions and cation concentrations at 23-C-l are generally similar to other sites near Site 23. Nitrite plus nitrate (expressed as nitrate) was 23.4 and 26.5 mg/l. Groundwater at Site 23 is a calcium bicarbonate type.

In the fourth quarter samples, toluene, lead, and TFH-gas were not detected in the original or field replicate samples. TFH-diesel was detected at 0.060 mg/l in the original sample and 0.080 mg/l in the field replicate. However, TFH-diesel was also detected at 0.050 mg/l in the equipment wash blank. TDS and nitrate were similar to the first round results: TDS was 422 and 345 mg/l in the original and field replicate samples, nitrate 23.1, and 25.2 mg/l.



4.1.23.1.4 Analytical Results Table

Table 4.1.23-2 presents a summary of all detected analytes for Site 23. Analytical data are presented in Appendix A. Related quality control data are also given in Appendix A as well as in Appendix F. Standards, criteria, and action levels presented in Table 4.1.23-2 are generally the lowest federal and state levels applicable to the sampled media (soil, groundwater, surface water). The values have been compiled from various sources. A more detailed assessment of ARARs is given in Appendix I.

4.1.23.1.5 Discussion of Analytical Data

Contaminants detected at Site 23 included total fuel hydrocarbons and related volatile organics in the soil boring samples. Lead was also detected in one of the soil boring samples. TFH-gas and diesel were detected in the groundwater, but those results are suspect (discussed below). Table 4.1.23-3 presents the range of contaminants encountered for each of the media sampled (soil borings and groundwater), as well as the number of positive detections compared to the total number of samples collected. Analytical data are presented in Appendix A.

No data corrections have been made based on method blank detections.

With the exception of certain possible false positive results (discussed below), analytical data are believed to accurately represent site conditions at the time of sampling. It should be noted that several of the possible contaminants detected in some soil samples were tentatively identified below the LOQ. These detections may represent laboratory "noise" and some of the analytes may not actually be present at the site. Analysis results for detected analytes are flagged with a "J" if the analyte was tentatively identified below the LOQ. For this study the LOQ is equal to the detection limit as defined in the QAPP. Analysis results for detected analytes are flagged with a "B" if the analyte was also detected in the method blank.

4.1.23.2 Sampling and Analytical Problems

4.1.23.2.1 Loss of Samples

There were no sample loss problems for Site 23 samples. Five soil samples, all from boring 23-C-2SB, were resampled for volatile organics analysis (8240) due to holding time

TABLE 4.1.23-2

BEALE AFB: SOIL DATA 1988/1989

ANALYTICAL RESULTS TABLE FOR SITE 23

				Standards, and Action	Criteria Levels (a)	23-C-158 BAFB-0338		23-C-1SB BAFB-0340	23-C-158 ^t BAFB-0341	23-C-158 BAFB-0342	23-C-158 BAFB-0343	
Parameter	Nethod p	Detection Limit	Units	Federal		1.0-2.5 ¹ 12/20/88	5.0-6.5' 1 12/20/88	10.0-11.5	11.5-13.0° 12/20/88	15.0-16.5	20.0-21.5 12/20/ 86	
		***		7	SA	20.7	20.7	19.8	16.9	16.7	16.4	•
Percent Moisture	ASSET	< ·	•	9 4	2	\$	9	6.2	9	9	2	
TFH-Diesel	TFM-D1	= \$		2 4	2 ×	15100	23700	12800	12000	9950	10100	
Aluminum		9.9		2 3	100 01	106	271	128	7	ž	\$	
		2.5		2 %	SH	7330	5070	4540	11500	3820	3700	
Calcium	2001	3 5		2 2	905	37.7	41.1	45.0	38.1	31.1	37.2	
		, d		2 4		0.2	16.4	16.2	16.8	7.02	4.4	
Cobelt) (7	200	0.09	61.5	141	9.67	42.0	37.3	
Copper		9 6		2 4	S.	28400	37100	23800	23300	21400	23200	
Lon		9		2 4	¥	27.2	8650	8190	0969	29	6330	
Magnes i un		3 -		n 4	2	112	228	×	462	90	\$	
Nanganese		n		2 4	200	17.71	3.6	54.9	22.9	7.02	16.7	
MICKE!	2000	? ?		Ž	SM	9	555	24	267	£	2	
Potestia		3 5		2 4	¥ 4	216	22	171	152	3	<u>\$</u>	
Sodium		35	1 / Y	2 3	207 ~	7.67	54.7	2	69.1	65.9	78.5	
Venedium		÷		2 4	, r.	3	S. K.	128	69.3	56.3	24.4	
Zine		9 c		2 %	ST	0.048	0.16	0.19	×	0.0	0.063	
Methylene Chioride	240540 240	35	1	¥	S	9	2	0.021	THE T	0.080	₽	
Acetone	S40240	500	2/0	2	SZ	9	2	0.13	Ħ	윺	윺	
2-Bultanone	270	5	2/5	2	SE	0.00	-	0.41	¥	0.089	0.21	
Toluene	200 A	3 8	,	2 4	S	9	0.006	2	=	2	2	
Ethylbenzene		3		7 · · · · · · · · · · · · · · · · · · ·								
MOTES: Results reported for detected and	detected ar	malytes only	<u>ر</u> ج				,			4	4.	
MT: analyte not tested					analyte detected	cted in blank	A		e: equi	equipment wash blank field conficate	DI BUK	
MD: analyte not detected.	ection lev		currently exists	ق د	estimated vali field blank (4	tue, betod quantifi (ambient condition		- ~	R: res	resample		

Mi: shalyte not tested. MD: shalyte not detected. MS: No standard criteria or action level currently exists.

values listed in () are 2nd column confirmation values. Ë

a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

For Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.23-2 (continued)

				Standards, C	Criteria Levels (a)	23-C-258 RAFR-0333	23-C-258* RAFR-0174	23-C-25B	23-C-258" BAFR-0375	23-C-258 BAFB-0335	23-C-258 BAF8-0376
		Detection		AND ACTION .	(8) 619/5	2.4-4.0	1.5-5.0			10.0-11.5	
Parameter	Method	Limit	Unita	Federal	State	12/20/88	01/06/89			12/20/88	
Percent Moisture	ASA#9	W/W	×	SE	SE	32.8	F	22	¥	27.5	=
TEX-Diesel	TEN-DI	1.0	mo/kg	SH	SH	510		<u>\$</u>	H	1.4	
	TFN-GA	S	Mo/kg	SH	SH	120	=	욮	H	₽	
Albiga Albiga	Sa46010	20.02	Po/ka	SE	SN	16700	×	18100		14100	
Borice	SW6010	10.0	2 /kg	SH	10,000	240	H	<u>7</u>	H	35	H
	Su6010	0.50	mo/kg	SN	ĸ	2	=	30.0	H	윺	
Catcium	Su6010	9	mo/kg	SH	SH	0767	=	5050	12	3%0	Ħ
Chromita	S146010	3.0	a/ka	SE	200	20.8	H	39.7		23.4	
Cobalt	St.6010	0.4	ma/ko	KS	8,000	17.9	Ħ	25.9	***	13.0	Ħ
11000	Su6010	0	o/ko	SZ	2,500	38.00	=	63.3	H	53.2	=
Trop	SAK010	10.0) 	SE	SE	31400	H	33200	H	26800	H
5	S146010	20.02	mo/ko	E SE	1,000	38.4	H	₽	F#	윷	-
Magnesia	SU6010	001	o/ko	S	₩	3350	×	9080	I	0267	H
Marca Canada	SUK010	2	0/ko	S	SE	1440		451	H	331	H
Tailed Loc	S146010	0.4	p/ka	S	2,000	13.7	Ħ	24.4	X	19.3	18
Potessin	SN6010	200	o/ko	SE	SE	8 6%		욮	H	276	H 38
Sodium	SW6010	100	mo/ka	SH	SE	33		203	H	546	H
Vanadius	St46010	0.4	mo/ka	SH	2,400	88.8	H	59.4	H	62.8	7
Zinc	SW6010	2.0	Z/ka	SN SN	2,000	87.6	Ħ	87.6	Ħ	۲. 0.	Ħ
Methylene Chloride	Su#240	0.005	mo/ko	SE	SN	H	0.035	*	욯	T.W	0.030
Acetone	SUB240	0.010	mo/ko	SE SE	SE	H	0.012	H	2		윺
Tolinan	072975	0.005	mo/kg	S	SE	H	0.021	Ħ	2	H	0.036
Ethylbenzene	SAR240	0.005	mo/ko	SE	SE	H	0.005	H	9.0	TN TN	0.003
Xvienes (total)	SHB240	0.005	Mo/kg	SH	SW	H	0.005	H	1.0	H	0.003

NOTES: Results reported for detected analytes only.

NT: analyte not tested

ND: analyte not detected.

NS: No standard criteria or action level currently exists.

e: equipment wash blank f: field replicate R: resample

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.23-2 (continued)

				and Artion Levels (a)			4550.034	PACD-0178			RAFR-0282
					_	KAPB-US//	AFB-0330	2172-0140			
	Hethod	Detection	Units	Federal	State	01/06/89	12/20/88	01/06/89	12/20/88	01/06/89	12/19/88
	SAMO	N/A	><	S#	SE	=	18.8	=	25.9		14.7
	6010	20.0	mg/kg	SE	SE	Ħ	20800	Ħ	19000		4510
	5010	10.0	mo/kg	SE	10,000	Ħ	575	H	169	H	113
	6010	0.50	mg/kg	SH	ĸ	Ħ	2	Ħ	79.0		2
	5010	5	mg/kg	S	SH	Ħ	2440	H	5360	H	1510
	16010	3.0	Mg/kg	SH	200	=	7.94	H	33.6	H	25.0
	16010	6.0	mg/kg	SE	8,000	Ħ	42.5	H	17.5		22.3
	W6010	3.0	mo/kg	SE	2,500	Ħ	69.3	H	6.67		25.3
	W6010	0.0	Mo/kg	SE	SH	Ħ	00007	H	28600	Ħ	15500
	16010	5	MO/kg	SH	SE	≒	9420	H	22	H	1170
	26 010	1.5	Mo/kg	SE	SE	#	2240	H	%	Ħ	882
	26010	6. 0	Mo/kg	SH	2,000	Ħ	28.1	H	21.6	Ħ	8.6
	16010	90 2	MQ/kg	SN	SE	H	505	Ħ	324		2
	16010	5	mg/kg	SE	SE	H	183	H	201	Ħ	107
	16010	0.4	mo/kg	SX	2,400	Ħ	120	H	57.9		61.4
	6010	2.0	mo/kg	SH	2,000	H	92.5	¥	73.7	H	22.3
	J8240	0.005	mo/kg	SH	SE	0.054	Ħ	0.052	H	0.035	0.00
	J8240	0.010	mo/kg	SE	SZ	0.027	H	9	H	0.00%	J 0.033
	J8 240	0.00	MG/kg	SH	SE	0.063	1	0.00	H	0.015	0.012
	W8240	0.00	MO/kg	SZ	Ş	0.018		皇	¥	욮	욡
Xylenes (total) SM	SNB240	0.005	20/kg	SH	S	0.020	Ħ	9	Ħ	9	욮

WOTES: Results reported for detected analytes only.

NT: analyte not tested ND: analyte not detected. ND: analyte not detected. NS: No standard criteria or action level currently exists.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

(): values listed in () are 2nd column confirmation values.
 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

e: equipment wash blank f: field replicate R: resample

TABLE 4.1.23-2 (continued)

				Standards, and Action	Criteria Levels (a)	25-C-358 BAFB-0283	23-C-358 BAFB-0284	25-C-358 BAFB-0285	23-C-358 BAFB-0286	25-C-358 BAFB-0332	23-C-458 BAFB-0344
arameter	Method	Detection Limit	Units	Federal	State	5.0-6.5	10.0-11.5 12/19/88	11.5-13.0° 12/19/88	-	12/19/88	
Secret Moieture	ASAMO	K/M	*	SE	S¥	19.3	17.3	18.1	18.2	18.3	23.9
FEL-Diese	TEM-DI	1,0	ma/ka	S	S	욮	2	2	2	2	1400
	161-G	2	ø/ka	SX	SE	7	8	&	2	9	5
Alteina	946010	20.0	mo/kg	SE	SH	11600	12200	9520	11800	13200	15000
No.	010978	10.0	mo/ko	SI	10,000	143	5 00	156	176	523	193
1:17	010975	0.50	mo/ka	S	K	₩	2	2	0.73	0.61	₽
	S46010	90	ø/ka	S	SE	5330	4330	3710	0804	0907	5230
#1000A	010975	M.	a/ka	S	200	26.1	38.5	28.0	31.7	39.4	35.9
	010978	7	o/ko	S	8,000	18.6	24.2	19.5	18.3	297	19.7
1000	946010	0	o/ko	S	2.500	50.8	65.7	48.6	44.5	62.7	50.3
	010978	10.01	p/ka	S	SE	20600	33400	22000	21500	31700	24300
tegree i. m	010978	90	o/ko	S	SZ	999	7400	0699	0269	2320	5120
	010978		o/ka	S	SE	419	10,0	7.47	611	1050	378
11040	010978	0.4	o/ka	S	2,000	38.4	23.0	24.4	19.6	27.5	23.7
Sofaes i.m	510010	200	mo/ko	SH	SE	548	305	256	306	306	58 2
Sodium	010975	9	a/ka	N.	SR	230	2	176	210	208	\$
an paragraphic	216010	9	ex/kg	Ş	2,400	38.9	129	76.1	£.3	116	61.6
, inc	SW6010	2.0	mo/ka	S	2,000	8.2	4.89	58.7	58.3	3.6	%. %.
tethylene Chioride	SAR240	0.005	an/ka	SE	SE	0.011	0.005	J 0.010	0.013	900.0	0.016
Metone	S-18240	0.010	mo/ko	SH	SE	0.043	0.007	J 0.016	0.016	J 0.015	윺
2-But anone	Su8240	0.010	mo/ko	SE	SE	2	0.017	0.044	9	0.070	욮
	07CBUS	0.005	mo/ka	SE	SE	0.021	0.065	0.13	0.095	0.12	0.012

e: equipment wash blank f: field replicate R: resample MOTES: Results reported for detected analytes only.

MI: analyte not tested

MI: analyte not tested

MI: analyte not detected.

M

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

				Standards, and Action	Criteria Levels (a)	23-C-458 BAFB-0345	23-C-4SB BAFB-0346	23-C-45B BAFB-0347	23-C-458 BAFB-0348	
Parameter	Method	Detection Limit	Units	federal	State	5.0-6.5 12/22/88	10.0-11.5 ¹ 12/22/88	15.0-16.5 12/22/88		
Descent Moieture	ACAMO	* /#	*	SI	SE	19.5	20.3	23.5	6.9	
		2,5	-0/kg	S	S	16600	15300	12800	9570	
		10.0	Z/ko	S	10,000	505	116	463	154	
	e constant	0.50	d/ka	S	K	2	2	0.78	a	
		00	p/kg	S	SE	5590	5280	4550	2560	
	of Owner	3.0	ma/ka	S	200	45.5	42.0	37.1	19.3	
Spel :	010973	7.0	mo/ka	S	8,000	26.3	17.6	47.1	17.2	
1,1000	01030	. N	ma/ka	S	2,500	8.89	56.0	47.6	26.0	
100	010340	10.01	0/kg	S	SZ	32300	29900	27800	17800	
Monorina	OLONIA OLONIA	9	a/ko	S	SE	8210	7280	7030	3910	
Modeone	010X	- -	o/ko	S	SE	850	637	2380	757	
	STANDIO TO STANDIO	7	mo/ka	S	2,000	32.4	28.5	33.2	14.0	
	010348	200	a/ka	S	SE	335	2	38	욡	
	Suko10	9	o/ka	S	SE	176	5	38	132	
Zanadi.	CLKO10	0.4	o/ka	S	2.400	103	67.1	80.5	8.09	
2 inc	SLK010	2.0	ø/ka	S	2,000	8.0	71.1	2.69	2.09	
Methylene Chioride	072975	0.005	mo/kg	SE	SE	0.032	0.013	0.017	9	
Acatona Acatona	070	0.010	mo/ka	S	SE	0.019	2	₽	2	
2-But appea	072975	0.010	mo/kg	S	SE	0.043	0.043	0.20	웆	
Toll speed	070	0.005	mo/ko	S	SI	0.073	0.11	0.077	0.23	

e: equipment wash blank f: field replicate R: resemple MTES: Results reported for detected analytes only.

MT: analyte not tested

MD: analyte not detected.

MD: detected.

MD: description limit f: field replicate represent most stringent standard or action level. See Appendix I.

MD: analyte not detected.

MD: description limit field replicate represent most stringent standard or action level. See Appendix I.

MD: description limit field replication level. See Appendix I.

MD: description limit field replication level. See Appendix I.

MD: description limit field replication level.

MD: detected.

MD: description limit field replication limit field rep

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.23-2

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 23

				Standards, and Action	Standards, Criteria and Action Levels (a)	23-C-1GW	23-C-16W			
Parameter	Method	Detection Limit	Unite	Federal	State	BAFB-0454 02/15/89	BAFB-0455 02/15/89	BAFB-0456 02/15/89	BAFB-0457 02/15/89	
Specific Conductivity	£120.1	1.0	umpos/cm	SE	8	507	507	=		
Temperature	E170.1	4/H	dep C	S	SE	17.0	17.0	=		
. 1	E150.1	K/X	ā	2-9	SE	7.11	7.11	=	=	
Aikalinity - Total	SP# 03	0.0	7	2	S	156.0	156.0			
Bicarbonate	SM4 03	1.0	1/2	SN	SE SE	190.3	190.3	12	H	
Total Dissolved Solids	E160.1	8 .0	Ž	500	200	359	340	6.0	=	
Chloride	E325.3	0.1	Ž	250	22	74.5	33.8	2		
Fluoride	E340.2	0.020	7	~	7.1	0.16	0.15	0.050		
Mitrate + Mitrite	£353.3	0.020	Ž	10	5	7:22	26.5	0.15		
Sulfate	E375.4	1.0	7	250	220	16.0	18.4	2	7	
TFN-Gas	TFH-GA	0.10	7	SE	SE	0.30	0.30	08.0		
Colcius	SW6010	. 8.	7	SX	N	45.4	50.0	2	=	
Magnesium	S46010	8.	7	SE	SE	16.4	17.3	2		
Sodium	S46010	9.6	7	SN	SE	30.4	31.6	2	E	
2 inc	Sta6010	0.0500	/	0.110	0.012	2	웆	0.0400		
Toluene	2700715	-	7	14,300	100	2(3)	2(1)	2	윺	
NOTES: Results reported for detected analytes only	or detected	analytes o	aly.	•	:					
HT: analyte not tested					analyte detected in blank	cted in blan	*	:	e: ednibe	equipment wash blank
MD: analyte not detected.	٠			ä	estimated value, below quantification limit	lue, below	s, below quantification	on limit	f: field	field replicate

MS: No standard criteria or action level currently exists. b: field blank (ambient condition blank) R: resample.
(): values listed in () are 2nd column confirmation values.
a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.
Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.23-2

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 23

				Standards, Criteria and Action Levels (a)		23-C-1GW	_	23-c-16#	23-c-164 ^b
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0718 11/29/89	BAFB-0719 11/29/89	11/29/89	BAFB-0721 11/29/89
	6120 1	1.0		SA	006	997	9,7		
specific conductivity	120	? \$		Ş	ST	20.0	20.0	*	
	6150.1	¥/#	7 1	8-9	SE	7.71	7.71	Ħ	NT
Alkalinity - Total	507703	1.0	*	2	SH	190.8	188.2	30.2	==
Bicarboote	204603	1.0	1/02	SE	SH	232.8	97.622	36.8	-
Total Dissolved Solids	E160.1	M	<u> </u>	200	200	725	345	15.0	=
Chloride	E325.3	1.0	7	220	220	7.76	35.1	£	H
Fincide	£340.2	0.050	/	~	4.4	0.18	0.17	ş	
Eithere + Mithite	E353.3	0.050	7	5	45	23.1	22.5	0.18	-
	7.57.5	1.0	/	250	220	21.4	14.5	욮	T
4EL-0-6-6-4	TFH-DI	0.050	Ž	S	SE	0.060	0.080	0.050	
	S16010	1.00	/	S.	SH	49.3	50.4	2	IN.
Manage in the second	SU6010	1.00	1	SE	SE	16.2	16.4	2	
	S146010	8	7	S	SE	1.19	2	2	LN
sodium	Su6010	8.	7	SE	SN	31.1	31.9	윤	Ţ.
MOTES: Results reported for detected analytes only. MI: analyte not tested MI: analyte not detected. MI: analyte not detected. MI: analyte not detected. J: estimated value, be besting to action level currently exists. b: field blank (ambien (): values listed in () are 2nd column confirmation values. s: Values represent most stringent standard, criteria or action level. See Appendix I. The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is efor Mitrate + Mitrite given as Mitrate. Detection limits are for dilution = 1.0 and represent target detection limits. Actual d	or detected or action te re 2nd colu tringent si Witrate + ven as Mitr		lytes only. currently exists. confirmation values and, criteria or acr rite is given as 10 and represent targe	B: a J: e J: e S: f Fes. action level 10 mg/l as M get detection	B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) on tavel. See Appendix I. @/l as Witrogen which is equal to the State of Cel detection limits. Actual detection limits for each	ted in blam La, below ombient con dix 1. h is equal	nk quantificati ndition blan to the Stat tion limits	on limit k) e of Calif for each a	ilytes only. B: analyte detected in blank J: estimated value, below quantification limit Currently exists. b: field blank (ambient condition blank) Confirmation values. Ind., criteria or action level. See Appendix I. Inite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

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Table 4.1.23-3
RANGES OF CONTAMINANTS DETECTED AT SITE 23

CONTAMINANT		MINIMUM	HAXIHUH	# DETECTIONS/
ANALYTE	UNITS	CONC.	CONC.	# SAMPLES
SOIL BORINGS				
TFH-diesel	mg/kg	ND	1,400	5/21
TFH-gas	mg/kg	ND	120	4/21
lead	mg/kg	ND	38.4	1/21
2-butanone	mg/kg	ND	0.20	7/21
ethylbenzene	mg/kg	NÐ	0.96	4/21
toluene	mg/kg	ND	1.1	20/21
xylenes (total)	mg/kg	ND	1.0	2/21
GROUNDWATER				
TFH-gas	mg/l	ND	0.30	1/2
TFH-diesel	mg/l	ND	0.08	1/2
toluene	ug/l	ND	2	1/2

NOTES: This table does not necessarily contain all analytes detected.

For organics, analytes also detected in method blanks at similar levels (B), and analytes detected only once at a level below the LOQ (J), are not included. Metals listed are those greater than 2 standard deviations above the background averages and possible indicators of site-specific contamination. General water quality parameters are also not included.

If present, () indicates that the value was tentatively detected below the LOQ. $\,$

violations. All scheduled analyses were completed for Site 23 except for one volatile organic analysis for the soil replicate QC sample collected at 11.5-13.0 feet in boring 23-C-1SB.

4.1.23.2.2 Likelihood that Positive Samples Were Contaminated in the Field or Laboratory

Soil samples collected at Site 23 contained several organic compounds that were probably laboratory or field induced false positive results. All but one of the soil samples collected contained methylene chloride and many of the samples also contained acetone. These are common laboratory contaminants and are probably false positive results.

Toluene was detected in all but one of the soil samples and only in the first quarter groundwater sample. Toluene was detected in samples taken throughout the base. Although toluene is not considered a common laboratory contaminant, the ubiquitous extent suggests that it is a false positive result. For the soil replicate QC samples (taken at this and other sites) in which toluene was detected, duplication of the toluene result was not good. This is another indication that the lower levels of toluene at the site probably are not true contaminants.

Two soil replicate QC samples were collected at Site 23. The first replicate, collected at 11.5-13.0 feet in boring 23-C-1SB, compared well to the original sample except for the following analytes: TFH-diesel was detected in the original at 6.2 mg/kg but not detected in the replicate, RPDs for calcium, copper, and zinc were 87, 96, and 60 percent, respectively. Volatile organic analysis was not completed for the replicate sample.

The second replicate QC sample, collected at 11.5-13.0 feet in boring 23-C-2SB, had good agreement to the original sample for metals, but volatile organics results did not agree well with the original sample. Acetone was not detected in the original sample but was reported in the replicate. Toluene, methylene chloride, ethylbenzene, and xylenes had RPDs of 56, 57, 157, and 161 percent, respectively.

A replicate groundwater QC sample was collected, as well as an equipment wash blank and an ambient condition blank in the first and the fourth rounds. Replicate results compared well to the original sample except that TFH-gas had a RPD of 80 percent. However, TFH-gas was also detected in the

equipment wash blank at 0.8 mg/l. In the fourth round, replicate results compared well to the original sample. TFH-diesel was 0.060 and 0.80 mg/l (RPD of 28 percent), but the TFH-diesel was also detected in the equipment wash blank at 0.050 mg/l.

4.1.23.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of Site 23 samples.

4.1.23.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.23.3 Significance of Findings

Soil

TFH-diesel and -gas were detected in samples from all four soil borings (Figure 4.1.23-4). Kylenes and ethylbenzene were detected up to 1.0 and 0.96 mg/kg in 23-C-2SB. No TFHs were detected in 15-foot or 20-foot samples from any borings at Site 23. These data suggest that fuel hydrocarbons leaked or spilled onto the pavement in the maintenance area and were washed into the storm drain and the drainage ditch. No DHS TTLC values are available for TFH-diesel or -gas. The LUFT cleanup standards calculated for Site 23 are 1,000 mg/kg for TFH-diesel, 100 mg/kg for TFH-gas, 1.0 mg/kg for xylene, and 1.0 for ethylbenzene.

Lead was detected in the 2.4- to 4-foot sample from 23-C-2SB at 38.4 mg/kg. The DHS TTLC for lead is 1,000 mg/kg.

Groundwater

TFH-gas was detected in the first round groundwater sample and in the field replicate, with an RPD of 80 percent. The concentration in the equipment wash blank (0.80 mg/l) exceeded that in the environmental sample (0.30 mg/l) or the field replicate (0.70 mg/l). Based on these findings the TFH-gas in the groundwater is suspect. In the fourth round, TFH-gas and toluene were not detected in any sample, further suggesting that they were not actually present in the groundwater in the first round. TFH-diesel, which was not detected in the first round, was detected in the sample,

replicate, and equipment wash blank in the fourth round, which suggests that TFH-diesel is not actually present in the groundwater.

4.1.23.3.1 Zones of Contamination

The contaminated zone at Site 23, based on four soil borings conducted in the Stage 2-1 study, is the uppermost 12 to 15 feet of soil near the borings.

Because of the uncertainty of the groundwater data, an accurate conclusion on groundwater contamination cannot be made at this time. The lack of reproducibility of toluene, TFH-gas, and TFH-diesel results at Site 23 suggests that they are not true contaminants in the groundwater at well 23-C-1. Additional sampling and analysis is required to reliably determine groundwater quality at Site 23.

4.1.23.3.2 Contaminant Migration

Based on the distribution of TFH contamination in the soil, contaminant migration in surface water is suspected. However, past fuel spill(s) into the storm drain may be the source of TFH in the soil at the drainage ditch. Review of the soil depths where TFH were detected indicate that, in the area of the borings, the vertical migration has not exceeded 15 feet.

Groundwater at Site 23 flows to the west at an unknown velocity. If the TFH-gas and diesel contamination detected in the groundwater represents actual contamination and not a false positive, then this would be expected to move with the groundwater.

4.1.23.3.2.1 Potential to Move Off Site and Off Base

The potential is high for fuel hydrocarbons transported in surface water to move off site and off base. Based on fuel hydrocarbon distribution in the sampled soil, it is probable that stormwater has transported the hydrocarbons from the pavement into the soil.

Although a conclusion has not been made about groundwater contamination, the potential is high for contaminated groundwater, if present, to move off site. However, based on the available information, the potential for migration cannot be accurately assessed at this time.

4.1.23.3.2.2 Rate and Direction of Migration Based on Hydrogeologic Properties

Based on stream flow observations made during Stage 2-1 field activities and the approximate distance to the base boundary along the path of surface streams (drainage ditch to Hutchinson Creek), runoff from Site 23 could cross the base boundary in 1-3 hours. This drainage path is to the south and west from the site.

4.1.23.3.2.3 Time of Travel to Receptors

Domestic water wells exist downgradient, but the impact, if any, from Site 23 is unknown. The groundwater velocity is unknown.

4.1.23.3.2.4 Applicability of Solute Transport Models

Solute transport models are not applicable at Site 23 because of the uncertainty of groundwater contamination.

4.1.23.3.2.5 Expected Spatial and Temporal Variations in Concentration

Concentrations detected in the soil decrease with depth, with no TFH detections in the 15-foot samples or below. Outside of the immediate building and concrete pad area, the concentrations are expected to be limited to the drainage ditch.

There does not appear to be any true temporal variation in groundwater at Site 23. The TFH-gas and diesel defections in the first and fourth rounds respectively are both suspect. They were each present in only one sample round.

4.1.23.3.3 Baseline Risk Assessment

No risk assessment activities were conducted as part of Stage 2-1.

4.1.24 DISCUSSION OF RESULTS FOR SITE 24: LANDFILL NO. 4

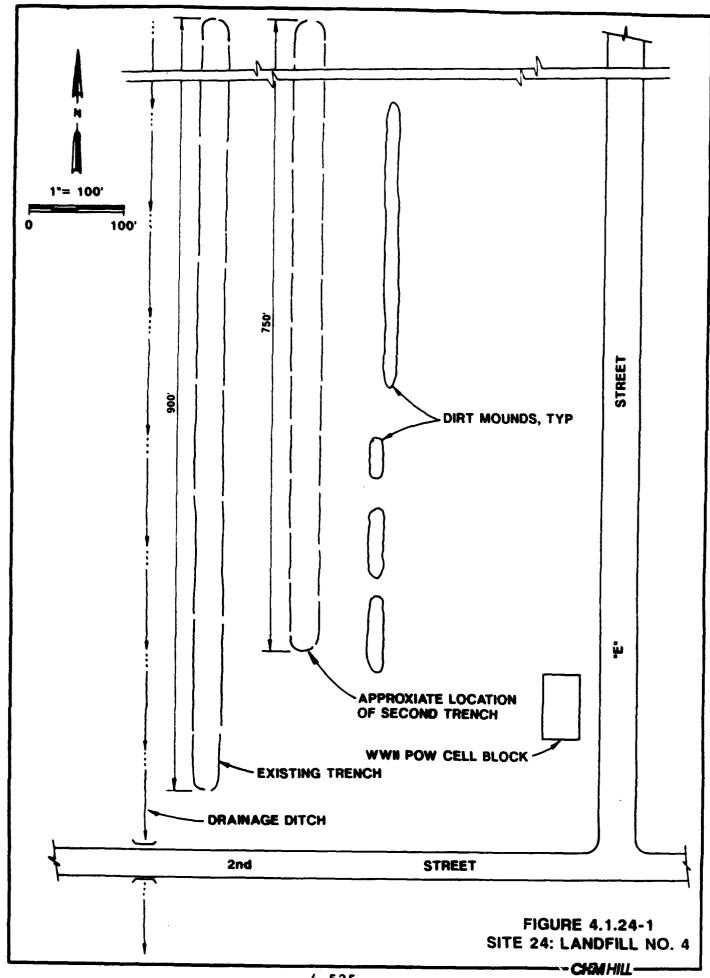
A records search was conducted to determine the location and operations history of Landfill No. 4. The landfill is located in the southern portion of the base, south of Gavin Mandry Road, north of 2nd Street and west of E Street and the World War II prisoner of war cell block (Figure 4.1.24-1).

4.1.24.1 Presentation of Results

No written records about the operation of Landfill No. 4 were available at Beale AFB. An interview was conducted on December 7, 1989, with Mr. James Armstrong, Superintendent of Horizontal Construction, 9th Civil Engineering Squadron, USAF, who has been employed at Beale AFB from the early 1960s. When interviewed at the site, he recalled that Landfill No. 4 consisted of two open trenches which were filled with general refuse. Used as burn pits, they often burned for a week at a time. A tree-lined trench running northsouth was (at the time of Stage 2-1 field work) approximately 900 feet long, 25 to 30 feet wide, and about 5 feet deep. During this site visit, the trench contained rubble and roofing material. A reported second trench, about 100 feet east of the first trench, has apparently been filled. It runs parallel to the open trench and is about 750 feet long by 30 feet wide. A series of mounds of soil oriented north-south lie east of the second trench. They are about 6 feet high.

If these trench dimensions are correct and the trenches contained 10 feet of refuse, then the approximate volume of material would be about 18,000 cubic yards. However, due to the trenches being burn pits, the actual volume of buried refuse may be a fraction of this.

Mr. Armstrong reported that the landfill was used by Air Force personnel and, during weekends, civilians from off base. The material disposed of in the trenches consisted primarily of household rubbish and construction debris. According to Mr. Armstrong, Landfill No. 4 operated from the 1960s to the early 1970s which corresponds, in part, to the operation of Landfill No. 2. If Landfill No. 4 was in operation prior to 1967, it could be a transition site between Landfill No. 1 (IRP Site 13), which was operated from World War II until an unknown date in the 1950s or 1960s, and Landfill No. 2, (IRP Site 6) which was opened in 1967. It seems unlikely that the base would have operated two landfills close to each other for an extended period.



Beale AFB Fire Chief Russell Dauterive has worked at the base since 1973. In an interview on August 15, 1989, he recalled that the landfill was used for many years prior to his arrival and covered a "large area," but was unsure of the dimensions. In 1974, a trench at Landfill No. 4, measuring about 150 feet by 30 feet and filled with blacktop and many other materials, was burned by the fire department to eliminate a large infestation of rats that posed a health risk. Chief Dauterive recalled the entire trench being lit at once and burning fiercely for several days before it was eventually extinguished by dousing it with large volumes of water and covering the trench with dirt using bulldozers.

4.1.24.1.1 Site Geology

No soil borings or monitoring wells were drilled at Site 24. No site-specific geologic descriptions are available. The nearest IRP site is Site 18 located about 2,000 feet north northwest of Landfill No. 4. A description of the geology of that site is given in Section 4.1.18.1.1.

4.1.24.1.2 Site Hydrogeology

No monitoring wells existed or were constructed at Site 24 during Stage 2-1. No site-specific hydrogeologic descriptions are available. The nearest IRP site is Site 18 located about 2,000 feet north northwest of Landfill No. 4. A description of the hydrogeology of that site is given in Section 4.1.18.1.2.

4.1.24.1.3 Analytical Results

No samples were collected from Site 24.

4.1.24.1.4. Analytical Results Table

No samples were collected from Site 24.

4.1.24.1.5. Discussion of Analytical Data

No samples were collected or analyzed from Site 24.

4.1.24.2 Sampling or Analytical Problems

No samples were collected from Site 24.

4.1.24.3 Significance of Findings

Based on the personal interviews conducted with Mr. Armstrong and Fire Chief Dauterive and a visual site inspection, a small scale landfill is evidenced at Site 24. No specific information on the operation or waste received was found. No liner or leachate collection system is believed to have been used at Landfill No. 4.

4.1.24.4 Baseline Risk Assessment

No risk assessment activities were performed as part of Stage 2-1.

4.1.25 DISCUSSION OF RESULTS FOR BACKGROUND MONITORING WELLS AND BACKGROUND SOIL BORINGS AT SITES 2, 3, 6, 13, 15, AND 19

This section provides discussion of environmental background conditions for groundwater and soils at Beale AFB. Though the IRP program at Beale AFB does not currently include a site numbered 25, the background information is discussed in this section as a matter of convenience.

Groundwater

Background groundwater conditions are described based on water samples collected from two monitoring wells installed upgradient of all IRP sites. Background wells were also installed at several individual IRP sites and are discussed in previous sections. These site-specific wells were not considered in this section because, although the wells may be upgradient from individual sites, they may be downgradient from other sites. Therefore, background wells at individual sites may not represent natural background conditions.

Soil

Background soil conditions are discussed as a point of comparison to results obtained at individual sites. This discussion is limited to analyses conducted for concentrations of metals. It was assumed that other contaminants of concern (fuels, solvents, and other organic compounds) are not naturally present in subsurface soils. To determine background metals concentrations, results of 31 soil sample analyses, collected in background soil borings at 6 IRP sites were averaged. Unlike the background wells at various sites, it was assumed that background soils at the six sites have not been affected by other IRP sites.

4.1.25.1 Presentation of Results

The following section presents the results of the field investigation at the two background wells. The discussion focuses on the geology and hydrogeology at the wells and presents the results of chemical analyses performed on samples of groundwater.

4.1.25.1.1 Site Geology

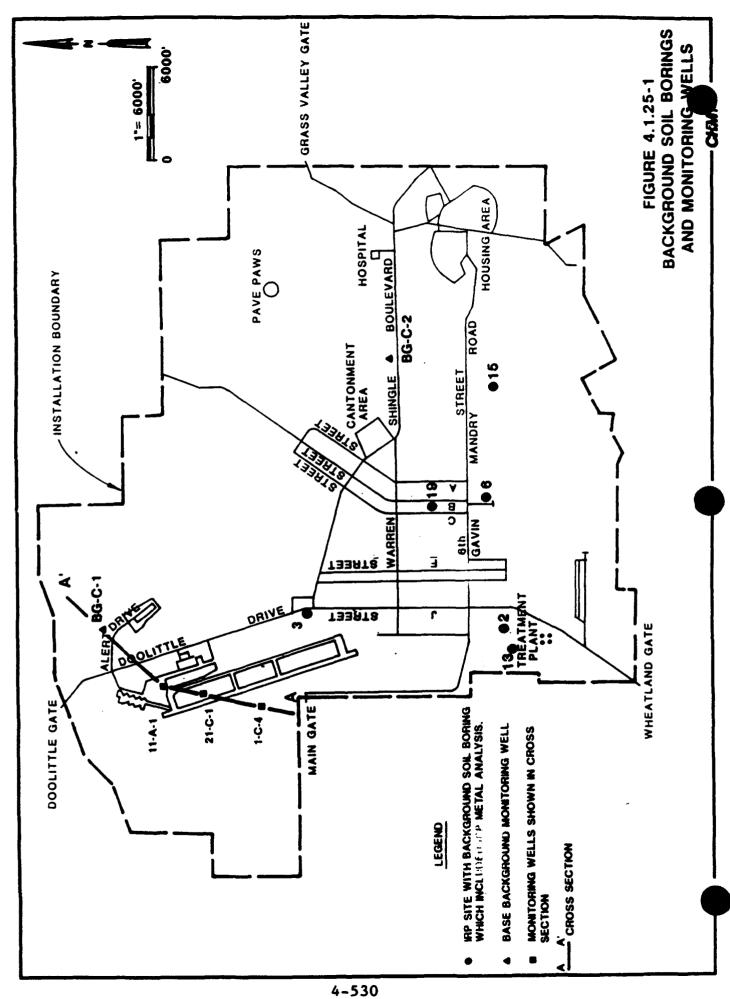
Evaluation of local geology at the background wells is based on drilling activities completed during the Stage 2-1

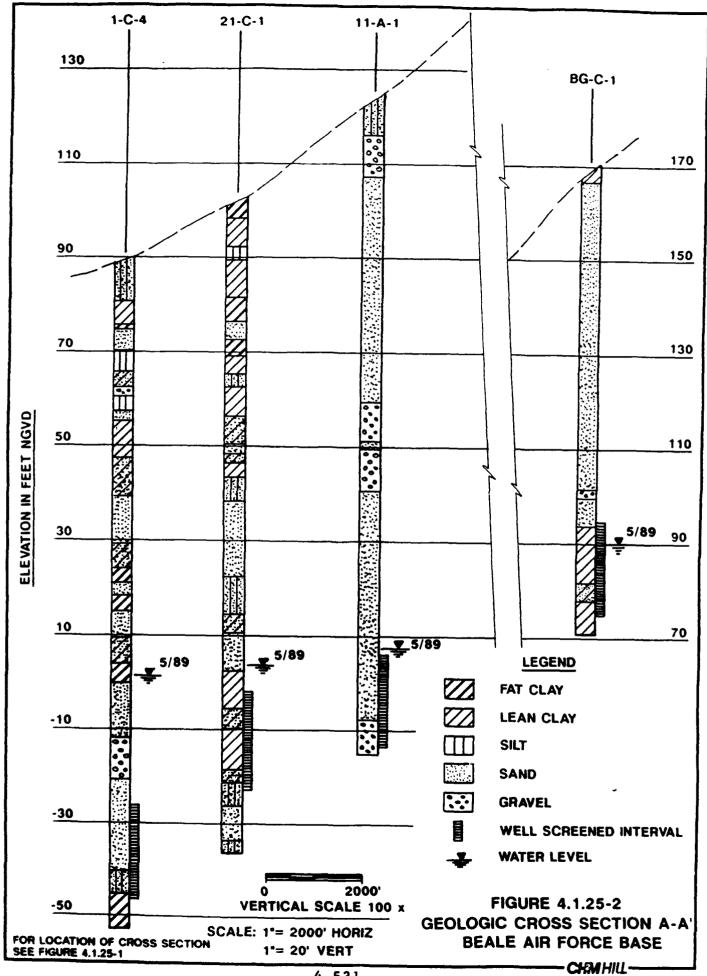
Remedial Investigation. There are two background monitoring wells at Beale AFB that were drilled during Stage 2-1. Background well No. 1 (BG-C-1) is located near the north edge of the base about 3,000 feet east of the Doolittle Gate on Alert Drive. Background well No.2 (BG-C-2) is located in the southeastern part of the base on Warren Shingle Boulevard across from the golf course. Both are screened across the water table. The location of these wells is shown on Figure 4.1.25-1.

Geologic cross-sections drawn through sediments encountered in the monitoring well boreholes in the north of Beale AFB, which includes BG-C-2, are located in Figure 4.1.25-1 and shown in Figure 4.1.25-2. Soil boring logs of wells BG-C-1 and BG-C-2 are provided in Appendix D.

BG-C-1 encountered a thick sequence of coarse-grained sediments throughout the vadose zone, with the exception of the uppermost 3 feet. The geologic cross-section shows that this sequence appears to be continuous with other wells in the north part of Beale AFB. As the borehole reached a depth of about 76 feet BGS (93 feet NGVD), however, the soil matrix began to be filled with clay. The saturated zone at this well lay in sandy clays, and the well is screened at a depth of 72-92 feet BGS (97 to 77 feet NGVD) in these materials of relatively low permeability. According to the soil boring log (Appendix D), the clasts were angular and composed of metabasalts. Therefore, the sediments may be derived from the basement complex of the Sierra Nevada. Page (1980) mapped the surface materials as belonging to the volcanic rocks from the Sierra Nevada. Soils at BG-C-1 were mapped as part of the Redding-Corning Association, a moderately deep and well-drained soil formed of alluvium derived from mixed sources (SCS, 1985).

Well BG-C-2 penetrated mainly sands and gravels to a depth of 36 feet (124 feet NGVD). At that point, the borehole entered a thick (over 20 feet) cemented conglomerate. The sands above this unit were wet, implying that some ground-water perching was occurring. The sediments were cemented through most of the remainder of the hole, except for a sand and gravel unit from 62 to 80 feet (98 to 80 feet NGVD). The hole was left open with the drill bit retracted in this unit overnight to see if it would yield water to the hole. However, the hole was dry in the morning. This confirmed that the wet sands at a depth of 36 feet (124 feet NGVD) were perched. The well was screened across the water table in sandstone at a depth of 84 to 104 feet (76 to 56 feet NGVD). Surface geologic materials at BG-C-2 were mapped as





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belonging to the Laguna Formation by Page (1980). Conglomerates and sandstones contacted at depth may have been part of the volcanic rocks from the Sierra Nevada. Soils were mapped as Redding-Corning Association (SCS, 1985).

4.1.25.1.2 Site Hydrogeology

Near-surface groundwater in wells BG-C-1 and BG-C-2 appears to flow under unconfined conditions. Well BG-C-1 produces water mainly from a sandy lean clay with gravel. Water was first noted during drilling at a depth of about 79 feet in well BG-C-1. After development, the depth to water in the well remained at about 79 feet (about 90 feet NGVD). Well BG-C-2 produces water mainly from a sandstone unit. Moist cuttings were first noted during drilling near the water table at a depth of between 85 and 90 feet. After development, the depth to water in the well was about 89 feet (72 feet NGVD).

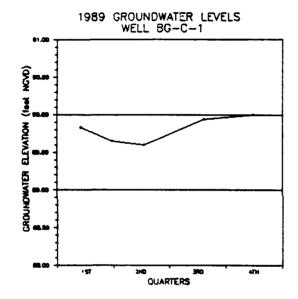
Groundwater level data from the background monitoring wells collected between February 1989 and May 1989 are presented in Table 4.1.25-1 and Figure 4.1.25-3. This table shows that the groundwater level remained relatively stable in both wells during this time, and may have slightly declined.

Table 4.1.25-1
GROUNDWATER ELEVATIONS IN BACKGROUND WELLS
(feet NGVD)

Well_	Screened	February	March	May	August	November
	<u>Interval</u>	1989	1989	1989	1989	1989
BG-C-1	95 to 75	89.83	89.65	89.60	89.94	90.00
BG-C-2	76 to 56	71.66	71.57	71.49	71.51	71.42

A complete summary of groundwater level measurements, including elevations and depths to water, is provided in Appendix G. These data show that water levels in wells BG-C-1 and BG-C-2 changed very little during 1989. This pattern was typical of wells constructed on the east side of Beale AFB.

March and November 1989 groundwater elevation contours plotted on wells at Beale AFB are presented on Plates 3 and 4. These plates demonstrate that groundwater in the vicinity of well BG-C-1 is flowing to the west-southwest. The hydraulic gradient west of the well is about 0.017. This relatively



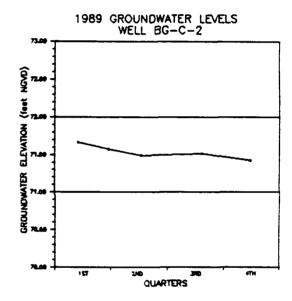


FIGURE 4.1.25-3
MONITORING WELL HYDROGRAPHS
BACKGROUND MONITORING WELLS

steep gradient is reflected in surface topography and is typical of flow along the boundary of the foothills and the Central Valley.

According to Plates 3 and 4, groundwater in the vicinity of BG-C-2 is also flowing to the west-southwest. The groundwater elevation in this well is depressed relative to that of other wells on the eastern edge of the base. This has the effect of causing the groundwater elevation contours to form a trough, with flow paths converging downgradient from well BG-C-2. A possible cause of the convergence may be the presence of a subsurface zone of relatively higher permeability such as an alluvium-filled sub-valley or highly fractured sandstones. The gradient in the vicinity of well BG-C-2 is about 10 feet per 2,000 feet, or 0.005.

Aquifer parameters for BG-C-l were derived from a slug test. This test was necessary because the yield of this well was too low to sustain a pumping test. The method employed was that of Bouwer and Rice (1976). Details of the method and a plot of the results are provided in Appendix E. According to the slug test, the hydraulic conductivity in the immediate vicinity of well BG-C-l is about 5.1 feet per day $(1.8 \times 10^{-3} \text{ cm/sec})$.

Aquifer parameters at well BG-C-2 were derived from a pump test according to the Cooper-Jacob Method (1946) from the water level data generated during 4 hours of monitored drawdown and recovery. Plots of the data and a discussion of testing methodology are provided in Appendix E. The pump test yielded an average value of transmissivity of 1,100 square feet per day and an average value of hydraulic conductivity of 68 feet per day.

4.1.25.1.3 Analytical Results

Groundwater

During each of the first three quarterly rounds of water sampling, one groundwater sample was collected from each background monitoring well (BG-C-1 and -2 located in Figure 4.1.25-1 and Plate 2). In the fourth round, only well BG-C-2 was sampled. Analyses performed for the groundwater samples were purgeable halocarbons (8010), purgeable aromatics (8020), semivolatile organics (8270), ICP metals (6010), arsenic (7060), lead (7420), mercury (7471), selenium (7740), TFH-diesel and -gas (California method), water quality parameters, and COD.

Bis(2-ethylhexyl) phthalate was detected in BG-C-1 at 14 ug/l in the first round. No arsenic, lead, mercury, or selenium was detected in background wells during this investigation. In the first sampling round, TFH-gas was detected at 0.10 mg/kg in BG-C-1 and at 2.0 mg/kg in BG-C-2. TFH-gas and -diesel were not detected in background wells BG-C-1 and -2 in the second and third sampling rounds. In the fourth round, TFH-diesel was detected in well BG-C-2 at 0.070 mg/l and bis(2-ethylhexyl)phthalate at 16 ug/l. Toluene was detected in the third round sample at BG-C-1 at 3 ug/l but was not detected in the second column confirmation.

The background wells are several miles apart and therefore their general water quality data are discussed separately.

Major anion and cation concentrations at BG-C-1 are generally similar to other sites near the flightline at Beale AFB except it had lower sodium and chloride and higher magnesium and bicarbonate. In the first, second, and third sampling rounds, water quality parameters had the following ranges. TDS ranged from 116 to 206 mg/kg. Sodium ranged from 10.7 to 11.3 mg/l. Nitrite plus nitrate (expressed as nitrate) ranged from 5.9 to 16.9 mg/l. Sulfate ranged from 3.4 to 4.4 mg/l, lower than at most sites at Beale AFB. Groundwater at BG-C-1 is a calcium-magnesium bicarbonate type. COD was below the detection limit.

Major anion and cation concentrations at BG-C-2 are generally similar to other monitoring wells in the southern part of Beale AFB. In the four sampling rounds, TDS ranged from 150 to 261 mg/l. Sodium ranged from 35.6 to 36.9 mg/l. Nitrite plus nitrate (expressed as nitrate) ranged from 11.7 to 16.3 mg/l and sulfate from 11.2 to 17.8 mg/l. Groundwater at background well 2 was a sodium bicarbonate type. COD was below the detection limit in the first three rounds. However, in the fourth round, COD was 62.6 mg/l in the original fourth round sample and 15.0 mg/l in the field replicate while not being detected in the equipment wash blank.

Soils

ICP metal concentrations in 31 soil samples from the background soil borings at Sites 2, 3, 6, 13, 15, and 19 were averaged. The mean average and standard deviation for concentrations of each metal were computed and are presented in Table 4.1.25-2.

Table 4.1.25-2 ICP METAL CONCENTRATIONS BASEWIDE BACKGROUND AVERAGES

ICP Metal		Standard Deviation (mg/kg)	Range of 2 Standard Deviations About the Mean (mg/kg)	No. Detected/ No. of Samples
Aluminum	14,186	1,720	10,746-17,626	31/31
Barium	149	48	53-245	31/31
Beryllium	b			1/31
Calcium	5,003	562	3,879-6,127	31/31
Cobalt	25	15	0-55	31/31
Chromium	31	8	15-46	31/31
Copper	44	12	21-67	31/31
Iron	25,843	3,925	17,993-33,692	31/31
Magnesium	5,480	674	4,133-6,827	31/31
Manganese	815	214	387-1,243	31/31
Nickel	23	4	15-31	31/31
Lead	^b			1/31
Potassium	551	210	131-970	28/31
Sodium	234	96	42-426	31/31
Vanadium	70	18	33-107	31/31
Zinc	57	7	43-70	31/31

Only ICP metals detected at least once in background borings are presented in this table.

beryllium was detected in only one sample at 0.62 mg/kg and lead was detected in only one sample at 24.2 mg/kg. Because these elements were detected in only 1 of 31 samples, calculation of a mean is not valid.

Bis(2-ethylhexyl) phthalate was detected in BG-C-1 at 14 ug/1 in the first round. No arsenic, lead, mercury, or selenium was detected in background wells during this investigation. In the first sampling round, TFH-gas was detected at 0.10 mg/kg in BG-C-1 and at 2.0 mg/kg in BG-C-2. TFH-gas and -diesel were not detected in background wells BG-C-1 and -2 in the second and third sampling rounds. In the fourth round, TFH-diesel was detected in well BG-C-2 at 0.070 mg/1 and bis(2-ethylhexyl)phthalate at 16 ug/1. Toluene was detected in the third round sample at BG-C-1 at 3 ug/1 but was not detected in the second column confirmation.

The background wells are several miles apart and therefore their general water quality data are discussed separately.

Major anion and cation concentrations at BG-C-1 are generally similar to other sites near the flightline at Beale AFB except it had lower sodium and chloride and higher magnesium and bicarbonate. In the first, second, and third sampling rounds, water quality parameters had the following ranges. TDS ranged from 116 to 206 mg/kg. Sodium ranged from 10.7 to 11.3 mg/l. Nitrite plus nitrate (expressed as nitrate) ranged from 5.9 to 16.9 mg/l. Sulfate ranged from 3.4 to 4.4 mg/l, lower than at most sites at Beale AFB. Groundwater at BG-C-1 is a calcium-magnesium bicarbonate type. COD was below the detection limit.

Major anion and cation concentrations at BG-C-2 are generally similar to other monitoring wells in the southern part of Beale AFB. In the four sampling rounds, TDS ranged from 150 to 261 mg/l. Sodium ranged from 35.6 to 36.9 mg/l. Nitrite plus nitrate (expressed as nitrate) ranged from 11.7 to 16.3 mg/l and sulfate from 11.2 to 17.8 mg/l. Groundwater at background well 2 was a sodium bicarbonate type. COD was below the detection limit in the first three rounds. However, in the fourth round, COD was 62.6 mg/l in the original fourth round sample and 15.0 mg/l in the field replicate while not being detected in the equipment wash blank.

Soils

ICP metal concentrations in 31 soil samples from the background soil borings at Sites 2, 3, 6, 13, 15, and 19 were averaged. The mean average and standard deviation for concentrations of each metal were computed and are presented in Table 4.1.25-2.

TABLE 4.1.25-3

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

AMALYTICAL RESULTS TABLE FOR BACKGROUND MONITORING WELLS

	• • • • • • • • • • • • • • • • • • •			4 4 4 4 4 4 4				
		9,000		and Action Levels (a)	evels (a)	BG-C-1GV	8G-C-2GM	
Parameter	Method	Limit	Units	Federal	State	02/23/89	02/15/89	
Specific Conductivity	£120.1	1.0	Lambos/cm	SE SE	8	£91	25	
Temperature	1.0213	* /#	5	S	SH	21.0	20.5	
7	E150.1	N/N	7	6- 9	SE	7.01	7.7	
Alkalinity - Total	204403	1.0	Ž	2	SN	7.8 8	72.8	
Bicarbonate	204403	1.0	7	SH	SH	120.0	8.88	
Total Dissolved Solids	E160.1	3.0	7	200	200	90 7	191	
Chloride	E325.3	1.0	/0	220	0 <u>\$</u> 2	3.0	7.5	
Fluoride	E340.2	0.050	7	~	1.4	0.16	0.49	
Eftrate + Eithite	E353.3	0.020	Ž	5	45	6.1	16.3	
Sulfate	E375.4	1.0	\ <u></u>	220	220	3.8	17.8	
TFH-Gas	TFH-G	0.10	7	SE	SI	0.10	2.0	
Calcium	Stu6010	5.8	702	SE	SX	17.9	6.91	
Magnesium	546010	8.	/	SZ	SZ	9.63	2.52	
Potassius	Suco10	5.	7	SH	SE	1.30	9	
Sodium	510010	- 8	/	SE	SE	10.7	35.6	
Zinc	S146010	0.0200	1/0	0.110	0.012	2	0.0380	
bis(2-Ethylhexyl)Phthalate	Sub270	5	1/8	SH	SE	2	700	
								,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

NOTES: Results reported for detected analytes only. NT: amalyte not tested ND: amalyte not detected.

B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank)

e: equipment wash blank f: field replicate R: resample

NS: No standard criteria or action level currently exists. (): values listed in () are 2nd column confirmation values.

a: Values represent most stringent standard, criteria or action level. See Appendix I.
* The federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate.

For Mitrate + Mitrite given as Mitrate.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.25-3

BEALE AFB: LATER DATA 2ND ROUND SAMPLING 1989

AMALYTICAL RESULTS TABLE FOR BACKGROUND MONITORING MELLS

				Standards, Co	Criteria Levels (a)	BG-C-1GU	BG-C-5GH	
Parameter	Method	Detection Limit	, inite	Section	State	BAFB-0555	BAFB-0554	
			:			40/05/50	40/05/50	
Specific Conductivity	£120.1	1.0	UMPOR/CM	S#	8	200	8	
Temperature	£130.1	∀/#	၁ ၉၈	SE	S¥	21.0	21.0	
ŧ	E150.1	4/ 8	7	2-9	SH	7.01	7.86	
Alkelinity - Total	20745	1.0	7	2	SH	100.2	3.5	
Dicarbonate	21 403	1.0	Ž	SH	SX	122.2	115.2	
Total Dissolved Solids	£160.1	3.0	Ž	200	200	<u>&</u>	ຄ	
Chloride	£325.3	1.0	2	8 <u>2</u>	220	2.5	8 .0	
Fluoride	E340.2	0.020	Ž	~	1.4	0.16	97.0	
Bitrate + Mitrite	E353.3	0.020	7	5	45	5.9	11.7	
Sulfate	E375.4	1.0	1/0	0 \$2	220	4.4	11.5	
Calcium	Stu6 010	-8	7	SR	SX	18.8	99.9	
Hegnes i um	Stu6 010	- 8	7	Ş	SH	9.71	2.51	
Potessium	Sw6 010	. 8	7	Ş	SH	1. 8	1.10	
Sodium	SW6 010	<u>-</u> 8	7	SE	S¥	1:1	36.9	
Toluene	SNB 020	-	7	76,300	5	~	2	
M-Mitrosodiphenylamine (1)	S46270	5	7	S	SH	•	79	
					,			

e: equipment wash blank f: field replicate R: resample B: analyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) (): values listed in () are 2nd column confirmation values. MD: enalyte not detected. MS: No standard criteria or action level currently exists. MOTES: Results reported for detected analytes only. if: analyte not tested

a: Values represent most atringent standard, criteria or action level. See Appendix I.
* The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.25-3

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR BACKGROUND NOWITORING WELLS

				and Action Levels (Levels (a)	BG-C-164	8G-C-2GW
		Detection				BAFB-0604	BAFB-0603
Parameter	Method	Limit	Units	Federal	State	08/52/80	08/52/90
Specific Conductivity	£120.1	1.0	anhos/cm	SZ	8	\$:
Temerature	E170.1) (40 (40 (40)	S	SE	21.8	
7	E150.1		Ŧ	2-9	SE	2.7	6.8
Aikalinity - Total			/4	2	SH	109.0	
Ricarbonate			7	SN	NS	133.0	
Total Dissolved Solids			Ž	200	200	116	
Chioride		1.0	7	20	250	3.9	
Fluoride		0.020	Ž	7	1.4	0.15	
Mitrate + Mitrite		0.020	7/0	0	45	16.9	
Suifete		1.0	7	220	250	3.4	
Calciu		÷.8	Ž	SE	SH	18.9	
Magnes ium		8.	7	SE	SE	10.2	
Sodiu		9.	7	SE	SH	11.3	
Tolume		-	7	14,300	5	m	
M-Mitrosodiphenylamine (1)		2	7	SE	SE	60	
bis (2-Ethylhexyl)Phthelete		5	3	S	SH	욡	

e: equipment wash blank f: field replicate R: resample MT: analyte not tested

MT: analyte not detected.

MS: malyte not detected.

MS: Mo standard criteria or action level currently exists.

MS: Mo standard criteria or action level currently exists.

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MS: Mo standard criteria or action level.

MS: Mo standard in () are 2nd column confirmation values.

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MS: Mo standard in () are 2nd column confirmation values.

MS: Mo standard criteria or action level. See Appendix I. B: analyte detected in blank
J: estimated value, below quantification limit
b: field blank (ambient condition blank) MOTES: Results reported for detected analytes only.

Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A. for Mitrate + Mitrite given as Mitrate.

TABLE 4.1.25-3

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR BACKGROUND MONITORING WELLS

		•		Standards, Criteria and Action Levels (a)	Criteria Levels (a)	BG-C-26W	8G-2-26W	BG-C-26M	8G-C-2GM	
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0714 11/29/89	BAFB-0715 11/29/89	BAFB-0716 11/29/89	BAFB-0717 11/29/89	
Specific Conductivity	£120.1	1.0	umbos/cm	SN	906	\$	\$	L R	-	
Temperature	E170.1	#/¥	Ges C	SE	SE	20.0	20.0	X	7	
£	E150.1	K/N	₹.	2-6	SH	8.26	8.26	Z	Ħ	
Alkalinity - Total	SPK 03	1.0	\/D#	20	SH	H	83.6	18.0	H	
Bicarbonate	SPK03	1.0	1/0	SE	N.	Ħ	102.0	22.0	¥.	
Total Dissolved Solids	E160.1	3.0	1/02	200	200	261	H	Ħ	H	
Chloride	E325.3	1.0	7	250	250	7.3	H	T.W.	H	
Fluoride	E340.2	0.050	7/02	2	1.4	0.51	H	Ħ	X	
Witrate + Mitrite	E353.3	0.020	/02	10*	45	13.4	×	H	H	
Sulfate	E375.4	1.0) 	220	220	11.2	H	H	H	
Chemical Oxygen Demand (COD)		7.0	/0	SN.	SN	62.6	15.0	2	¥	
TFN-Diesel		0.050	7/0	SN	SN	0.070	LN	T.W	K	
Calcium	SW6010	1.00	1/8	SN	SN	6.61	H	F	Ħ	
Nagnesium	SW6010	9.	1/6	SE	SH	2.33	H	Ħ	¥	
Sodium	SW6010	9.	7	SH	SH	36.0	H	H	¥	
Methylene chloride	SW8010	S)/gn	SH	SN	\$	Ş	270(430)	490(530)	
Diethylphthelate	SW8270	5	/gn	SE	SN	•	BJ 7	8. 5	ES.	
M-Witrosodiphenylamine (1)	SW8270	5)/Bn	SE	SH	12	13	11	- E	
Di-n-Butylphthalate	SW8270	2	7/80	SX	SX	7	3	B 12	. N	
bis(2-Ethylhexyl)Phthalste	SIMB270	2	7	SN.	SE	4	17	12	T.W	
NOTES: Results reported for detected	detected	ansivtes only	oly.				: : : : : :		; ; ; ; ; ; ; ;	
M7: analyte not tested		•	•	- C	nelyte dete	analyte detected in blank	¥		e: equipa	ent wash blank
ND: analyte not detected.					stimated va	estimated value, below quentification limit	quentificet	ion limit	f: field	f: field replicate
MS: No standard criteria or action level currently exists.	action to	evel curren	itly exists.	ä	ield blank	field blank (ambient condition blank)	dition bla	k)	R: resom	je j
(): values listed in () are 2nd column confirmation values	e 2nd coli	ann confirm	nation value						•	
					•					

* Values represent most stringent standard, criteria or action level. See Appendix !.
 * The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.
 Detection limits are for dilution = 1.0 and represent target detection limits. Actual detection limits for each analysis are given in Appendix A.

TABLE 4.1.25-3

BEALE AFB: WATER DATA 1ST ROUND SAMPLING 1989

AMALYTICAL RESULTS TABLE FOR BACKGROUND MONITORING WELLS

				Standards, Criteri	Criteria			3 6 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
				and Action	Levels	BG-C-1GW	8G-C-56N	
Parameter	Method	Limit	Units	Federal	State	BAFB-0468 02/23/89	BAFB-0458 02/15/89	
Specific Conductivity	£120.1	;	umpos/cm	:	006	101	26	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
Temperature	£170.1	W/A	O Geo		SI	21.0	- °	
£	E150.1		7		S	7.01	7.7	
Alkalinity · Total	204403	1.0	7	2	S	8	2 2	
Bicarbonate	2044	1.0	7	S	S	0 051) e	
Total Dissolved Solids	£160.1	3.0	/4	905	5	25	3	
Chloride	E325.3	1.0	7	, S	£ 5	3 5		
Fluoride	E340.2	0.050	7	^	7	; ; ;		
Mitrate + Hitrite	E353.3	0.050	``	. •	7.	3 *	A	
Sulfate	E375.4	0-1	Ì	2 %	Ç	- •		
TFM-Gan	TEMPER	2		3	Ç :	0.7	17.8	
	5	2.5	ž	S	S	0.0	2.0	
	5000	. 8	Ž	S#	SH	17.9	6.91	
Negnestus	Sta6010	<u>-</u> 8.	ž	SE	SH	59.0	2 52	
Potestia	Succo10	5 .8	Ž	S	S	5	: :	
Sodium	Succ 10	.	Ž	S	S	10.7	2 %	
2 inc	State 010	0.0500	7	0.110	0.012	\$	0000	
bis(2-Ethylhexyl)Phthalate	SMB 270	2	3	S	S	12	78 9	
MARK								
Political Personal for detected and little and	sections bes	;		i				
				•	200			

Detection limits for dilution = 1.0.

MS: MS: analyte detected in blank

J: estimated value, below quantification limit MD: analyte not detect

MS: Mo standard criteria or action level currently exists.

D: field blank (ambient condition blank)

E: equipment useh bit resample

A: values represent most stringent standard, criteria or action level. See Appendix I.

The Federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l

for Mitrate + Mitrite given as Mitrate.

NT: analyte not tested ND: analyte not detacted e: equipment wash blank f: field replicate

TABLE 4.1.25-3

BEALE AFB: MATER DATA 2ND ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR BACKGROUND MONITORING WELLS

				Standards,	Criteria			
				and Action Levels	Levels	86- C-1 G M	BG-C-50M	
		Detection	-			BAFB-0555	BAFB-0554	
Parameter	Method	Limit	Units	Federal	State	05/30/89	05/30/89	
Specific Conductivity	£120.1	1.0	Carros/Car	SN	86	00Z		
Temperature	£170.1	*/	O Geo	SZ	SH	21.0		
	E150.1	W / W	₹.	2-9	SH.	7.01		
Alkalinity - Total	504403	1.0	7	0 2	SH	100.2		
Ricarbonate	204403	0.7	Ž	SH	SH	122.2		
Total Dissolved Solids	£160.1	N.0	Ž	200	200	<u>\$</u>		
Chloride	E325.3	1.0	7	22	220	2.5		
Fluoride	£340.2	0.050	7	~	1.4	0.16		
Mittate + Mitrite	£353.3	0.050	Ž	10	45	5.9		
Still face	£375.4	1.0	Ì	220	250	4.4		
	010978	00	Ž	S	SH	16.8		
Magnesit	010978	1.00	Ì	SE	SN .	9.77		
Potagain	S146010	8	7/0	SE	SE	1.8		
Section	010975	90	ž	SZ	SH	11.1		
Toluene	SMB020	-	3	14,300	6	2	9	
M-Mitrosodiphenylamine (1)	S46270	2	1/85	SN	SH	•	_ ;	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
WOIES:	7	enelytes only.		•	nalyte dete	B: analyte detected in blank	ž	MT: analyte not test
The same of the sa				•		1.0	Aile maide and Aile	Attach not detailed the

MD: analyte not detected e: equipment wash blank f: field replicate ted as values instead in () are 2nd column confirmation values.

as values represent most stringent standard, criteria or action level. See Appendix 1.

The Federal standard for Mitrate + Mitrite is given as 10 mg/l as Mitrogen which is equal to the State of California Standard of 45 mg/l for Mitrate + Mitrite given as Mitrate. J: estimated value, below quantification limit b: field blank (ambient condition blank) Detection limits for dilution = 1.0. HS: No standard criteria or action level currently exists. (); values listed in () are 2nd column confirmation values.

TABLE 4.1.25-3

BEALE AFB: WATER DATA 3RD ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR BACKGROUND MONITORING WELLS

				and Action Levels	evels	BG-C-1GN	BG-C-2GH
Parameter	Method	Detection Limit	Units	Federal	State	BAFB-0604 08/25/89	BAFB-0603 08/25/89
Concider Conductivity	F120.1	1.0	Legios/CB	SH	906	ž	200
Jensey 11 Commercially	F170.1	W/W	O oap	SE	SE	21.8	
	F150.1	¥/#	1	8-6	SH	2.7	
Albelinity . Total	20703	1,0	1/0	20	SH	109.0	
Dicertoopte	20775	1.0	Ì	SH	#S	133.0	
Trees Diseased Colide	F 140 1	O M	Ì	200	200	116	
	2	-	Ì	250	250	3.9	
	5.675	050	ì	~	7.1	0.15	
Nicolary A Michigan	1 1513	0.050	Ì	0	\$	16.9	
Miliate william	13 X X	-	Ì	250	250	3.4	
	010978	1.00	Ì	SR	SE	18.9	
	OLOWIN S	8	Š	SI	S	10.2	
	OLONIA OLONIA	90	Ì	SE	S	11.3	
Toline.	Su 2 020	-	9	14,300	901	m	
N-Mitroandiphenylamine (1)	Suc 70	2	7	SH	SH	•	
bis(2-Ethylhexyl)Phthelete	SM6270	2	7	SH	S	2	

Limit		f: field replicate	
B: analyte detected in blank J: estimated value, below quantification limit		se. r: resemple	tanderd criteria or action level. See Appendix 1.
MAINER: Results reported for detected analytes only. Detection limits for dilution = 1.0.	NS: No standard criteria or action level currently exists.	(): values listed in () are 2nd column confirmation values.	as welling contragant many stringent standard criteria or

TABLE 4.1.25

BEALE AFB: WATER DATA 4TH ROUND SAMPLING 1989

ANALYTICAL RESULTS TABLE FOR SITE 25

				Standards, Criteria and Action Levels (a)	iteria evels (a)	BG-C-2GW	BG-2-26W	8G-C-2GW	BG-C-2GW	
Parameter	Method	Detection Limit	Units	Federal	State	11/29/89	11/29/89	11/29/89	11/29/89	
Specific Confectivity	E120.1	1.0	umpos/cm	SZ	SX	25	Ē	-	12	
Temperature	E170.1	V/W	dea C	S¥	SN	20.0		Ħ	1	
	£150.1	¥/¥	ā	SE	SN	8.26		LN L	H	
Alkalinity - Total	SM46.03	1.0	7/02	SM	SE	F#		18.0	EN.	
Bicarbonate	SH4.03	1.0	1/04	S¥	SR	Ŧ	•	22.0	H	
Total Dissolved Solids	E160.1	3.0	7/02	200	200	261		Ħ	H	
Chloride	£325.3	1.0	7	220	250	7.3		H	H	
Fluoride	E340.2	0.050	7/2	~	1.4	0.51		*	H	
Mittate + Mitrite	E353.3	0.050	1/00	•	45	13.4	T	Ħ	Ħ	
Sulfate	E375.4	1.0	1/0	250	250	11.2		I	Ħ	
Chemical Oxygen Demand (COD)	E410.4	7.0	/	SI	SN	62.6	15.0	욽	¥	
TFK-Diesel	TFH-DI	0.050	1/8	SX	SN	0.070	12	F	EN.	
Calcius	SW6010	1.0	1/0	SN	SN	6.61	I	H	T#	
Kaonesius	SW6010	8.	1 /2	NS	SN	2.33	Ħ	TX.	H	
Sodium	SW6010	1.00	1/08	NS	SZ	36.0	H	=	Ħ	
Methylene chloride	SU8010	•	7/00	SN	SN	웆	2	270(430)	(025)067	
Diethylphthalate	SUR270	5	7			•	8) Z	83 5	B. NT	
N-Nitroendinhenvlamine (1)	SU8270	.	1/00			12	13	=======================================	1 2 6	
Di-p-Rutylohthalate	SU8270	1	3			71	8 15	8 12	E .	
bis(2-Ethylhexyl)Phthalate	SW8270	2	2/8	N	SN N	2	11	12	T.W.	
MOTER	•			• • • • • • • • • • • • • • • • • • •	1 1 1 1 1 1 1 1 1					

NT: analyte not tested ND: analyte not detected e: equipment wash blank (): values listed in () are 2nd column confirmation values

 a: Values represent most stringent standard, criteria or action level. See Appendix I.
 e: The federal standard for Nitrate + Nitrite is given as 10 mg/l as Nitrogen which is equal to the State of California Standard of 45 mg/l for Nitrate + Nitrite given as Nitrate.

 Detection limits based on contract limits; actual detection limits for each analysis are given in Appendix A. f: field replicate B: enalyte detected in blank J: estimated value, below quantification limit b: field blank (ambient condition blank) r: resemple NS: No standard criteria or action level currently exists. NOTES: Results reported for detected analytes only. Detection limits for dilution * 1.0.

results. It is unknown what the source of the TFH-gas is. It could be related to rinsing the bailer with hexane prior to sampling, but the second, third, and fourth rounds of sampling did not detect TFH-gas. The other detected analyte, bis(2-ethylhexyl) phthalate, was detected in both samples in the first round and from BG-C-2 in the fourth round but was also detected in one of the corresponding method blanks. Bis(2-ethylhexyl)phthalate was detected in the original, field replicate and equipment wash blank samples from BG-C-2 in the fourth quarter. Phthalate compounds were detected in samples from throughout the base and many of the laboratory method blanks, and probably represent false positive results.

In the fourth quarter samples from BG-C-2, methylene chloride was not detected in the normal sample or field replicate, but it was detected in the equipment wash blank at 270 ug/l (430 ug/l in the second column) and the ambient condition blank at 490 ug/l (530 ug/l in the second column). This has been traced to methylene chloride contaminated distilled water used for the blanks and occurred in several blank samples during the Stage 2-1 investigation.

No groundwater QC samples were collected during the first three rounds of background water sampling. N-nitrosodiphen-ylamine was detected below the LOQ in both the sample and the method blank for background wells BG-C-1 and BG-C-2 in the third sampling round. In the fourth quarter original, field replicate and equipment wash blank samples from BG-C-2, diethylphthalate was detected below the LOQ in the sample and the associated method blank, and N-nitrosodi-phenylamine and di-n-butylphthalate were detected in the samples and associated method blanks.

Thallium was detected in six background soils samples but is not included in the table. These and all thallium results are false positive results due to an interference problem (primarily with titanium) in the ICP metals analysis. Analysis of thallium by ICP suffers from spectral interferences from titanium. The interferences occur on both sides of the spectral bandwidth, and are difficult if not impossible to correct for when the concentration of thallium is low compared to the concentrations of the interferents.

4.1.25.2.3 Analytical Results Obtained under Out-of-Control Conditions

No out-of-control conditions existed for analyses of background groundwater samples. 4.1.25.2.4 Corrective Actions Applied to Out-of-Control Events

No corrective actions were required.

4.1.25.3 Significance of Findings

Groundwater levels and quality data are believed to represent conditions at the background wells at the time of measurement and sample collection, with the exception of the suspected false positive result for TFH-gas in the first sampling round and the phthalates in most samples.

The source of the elevated COD in the fourth round samples from BG-C-2, after the first three rounds were non-detects, is unknown. The reason may be related to irrigating the nearby golf course with gray water. The significance of the isolated TFH-diesel detection at BG-C-2 in the fourth round is unknown.

A statistical range of two standard deviations above and below the ICP metal value mean averages in 31 background samples was arbitrarily used to assess whether detected ICP metals at a particular site were high or low. This statistical range was compared with individual metal concentrations obtained at potentially contaminated areas. Naturally occurring metal concentrations may exceed this arbitrarily selected range.

In the background soil samples, lead was only detected in the surface sample in the background boring at Site 3, the Fire Protection Training Area. Although the background boring is 300 feet from the underground fuel storage tanks, leaded fuel may have been spilled in the vicinity of the background boring location at some time in the past. Beryllium was only detected in the 40-foot-deep sample from background boring 2-C-7 at Site 2. The beryllium concentration of 0.62 mg/kg, the analytical detection limit, is believed to represent the natural concentration of beryllium in that sample.

4.1.25.4 Baseline Risk Assessment

No risk assessment activities were performed as part of Stage 2-1.

4.2 PRIORITIZATION OF SITES FOR REMEDIAL ALTERNATIVES

This section presents discussion of prioritization of IRP sites, definition of individual sites grouped together as operable units, and preliminary identification of actions or additional data required at individual sites. The considerations are based on information collected in Stage 2-1 (CH2M HILL), Phase II, Stage 1 (AeroVironment), and other sources.

4.2.1 Relative Severity of Contamination

The IRP sites at Beale AFB have been prioritized, and are rank listed in Table 4.2.1-1. It should be noted that risk assessment activities have not been conducted which is why relative toxicity, and other related criteria, were not considered. This ranking was accomplished by considering the following criteria, which are presented in descending order of importance. Not all criteria were applicable at each site.

The ranking criteria considered:

- o If contamination was present and, if so, which media were affected? Groundwater contamination was considered the most serious, surface water and sediments second, soil in the vadose zone third, and air fourth.
- o If contamination was present, what was the level compared to regulatory standards and criteria? Primary or secondary MCL values were considered for groundwater. California DHS TTLC values or LUFT cleanup standards were used for comparison with soil contaminant concentrations. Many contaminants do not have specific standards or criteria at this time. All contaminants, however, must be considered during future risk assessment activities.
- What is the proximity of the site to known or potential receptors?
- o What is the relative mobility of the contaminant in the environment?
- o What is the physical setting of the site, especially with respect to relative permeability of the soil and proximity to surface water?

Table 4.2.1-1 RANKING OF IRP SITES BASED ON SEVERITY OF CONTAMINATION

Site <u>Number</u>	Site Name	Ranking
13	Landfill No. 1	1
1	West Drainage Ditch	2
2	Photo Wastewater Treatment Plant	3
5	SR-71 Shelters Drainage Area	4
21	JP-7 Above Ground Fuel Storage Tanks	5
3	Fire Protection Training Area	6
18	Bulk Fuel Storage Area	7
23	Ninth Transportation Refueling/Maintenance Shop	8
6	Landfill No. 2	9
19	Photo Waste Emergency Holding Basin	10
24	Landfill No. 4	11
15	Landfill No. 3	12
20	Grease Pit	13
16	Explosive Ordnance Disposal Area	14
11	Aircraft Ground Equipment Maintenance Area	15
8	J-57 Test Cell	16
10	J-58 Test Cell	17
14	Transformer Drainage Pit	18
4	Battery Shop Dry Well	19
9	Entomology Building 2560	20
22	Abandoned Underground Storage Tanks	(Unranked)
7	Army Biological Production Area	(Unranked)
12	Entomology Building 440	(Unranked)
17	Best Slough	(Unranked)

o What is the history or longevity, and estimated volume of the source at the site?

The listing presented in Table 4.2.1-1 ranks all sites addressed in Stage 2-1, except Site 22. Site 22 was not ranked with the other sites because, although the site has potential for contamination, no samples were collected or analyses performed. Therefore, no data were available for comparison with data from other sites. Site 22 is addressed later in Section 4.2 with discussion of additional data needs. Site 24 also had no samples collected. This site is included in the rank listing because, unlike Site 22, Site 24 can be directly compared to other sites for which data exist.

Sites 7, 12, and 17, which have previously been recommended for No Further Action, have not been included in the ranking.

Sites 8, 10, and 14 have been included in the ranking, but no RI activities were conducted during Stage 2-1. Ranking of these sites is based entirely on previously collected, limited data.

The rank prioritization of IRP sites at Beale AFB with supporting reasons based on Stage 2-1 and previous work is:

Site 13:

- o Volatile organic compounds detected in groundwater and soil
- o TCE detected in groundwater at up to 300 times MCL (5 ug/1)
- o Proximity to off base domestic well (2,200 feet)
- o TCE is a mobile compound in water
- o Contaminants appear to be widespread in ground-water
- o Site has existed since the 1940s and contaminants may have been entering groundwater over 40 years

Site 1: West Drainage Ditch

o Volatile organic compounds detected in surface water and groundwater

- o TFH-diesel and -gas detected in surface water and sediments
- o TCE detected in groundwater above MCL (5 ug/1)
- o Proximity to base water supply wells
- o Potential for stream and groundwater transport off base
- o TCE and dissolved fuel hydrocarbons are mobile in water
- o Sediment contamination exists throughout length of sample collection area
- o Long history of flightline runoff

Site 2: Photo Wastewater Treatment Plant

- o TCE detected in soil and groundwater (first round) in adjacent boring and well (2-C-2SB and 2-C-1) (at levels below TTLC and MCL)
- O Cyanide detected in sludges, surface soils, vadose zone soils and groundwater (second and third rounds)
- o Dioxins detected in sludge pond sediments (at a level below TTLC)
- o Proximity to domestic well (3000 feet)
- Long term documented operations

Site 5: SR-71 Shelters Drainage Area

- o TCE detected in groundwater (only in third round, not in first round samples)
- o TFH detected in surface water
- o TFH detected in surface soil samples
- o Contributing source to Site 1
- o Proximity to base boundary
- o Long history of fuel discharges from SR-71s

- Site 21: JP-7 Above Ground Fuel Storage Tanks
 - o TFH-gas detected in groundwater (only in first round, not confirmed in the third round samples)
 - o TFH detected in ditch sediments
 - o TFH inferred in surface water based on ditch sediment contamination and Stage 2-1 observations of surface water sheen
 - o Probable contributing source to Site 1
 - o Proximity to base boundary
- Site 3: Fire Protection Training Area
 - o TFH-diesel and -gas detected in soil
 - o Heavy metal detected in soil (below TTLC)
 - o Large volume of contaminated soil
 - o No detected groundwater contamination
 - o Documented history of activities
- Site 18: Bulk Fuel Storage Area
 - Surface soil contaminated with TFH-diesel, -gas, and heavy metals (all below TTLC)
 - o Potentially large volume of contaminated soil
- Site 23: Ninth Transportation Refueling/Maintenance Shop
 - o TFH-gas and diesel detected in groundwater (suspect results not confirmed in multiple rounds)
 - o TFH detected in soil, both on site and in ditch draining away from site
 - o Inferred surface water transport from Site 23
- Site 6: Landfill No. 2
 - o Tentative volatile organics in soil (below LOQ)

- o Large waste volume, waste composition unknown
- o Documented operation history of landfill

Site 19: Photo Waste Emergency Holding Basin

- o Soil contamination detected in EHB clay bottom
- o No detected soil contamination above action levels beneath EHB
- o Lead, zinc, and manganese detected in groundwater (but probably not from this site)
- o TCE, carbon tetrachloride, toluene, ethylbenzene, and xylele detected in groundwater (but probably not from this site)
- o Surface water had very low pH (4.15) and high metals concentrations, but only in the fourth round (probably not from this site)

Site 24: Landfill No. 4

- O Based on time of operation relative to Landfills No. 1 and No. 2, both of which have at least tentative volatile organics in soil
- o Unknown waste type
- O Upgradient of Sites 2 and 13, possible groundwater contamination source

Site 15: Landfill No. 3

- o No detected groundwater contamination
- o Sporadic TFH in soil (possible false positives)
- o Contamination detected in ambient downwind air sample
- o Contamination detected in landfill gas sample
- o Active landfill

Site 20: Grease Pit

- Oil and grease, phenol, and metals detected in sediments (all below respective available TTLC values)
- o No contamination detected beneath pit in one angled soil boring
- o No groundwater data at Site 20 but, groundwater in area is contaminated with TCE (Site 13)

Site 16: Explosive Ordnance Disposal Area

- o Metals and TFH-diesel detected in sediments from scrap metal trench (all below respective available TTLC values)
- o TFH-gas detected in groundwater (fourth round only)
- o RDX was detected and TNT tentatively detected (fourth round only)
- o Active facility but low use area

Site 11: Aircraft Ground Equipment Maintenance Area

- o TFH detected in surface soil (upper 3 to 5 feet)
- o No detected groundwater contamination

Site 8: J-57 Test Cell

- o Oil and grease, petroleum hydrocarbons, BETX, and solvents detected previously in shallow soils
- o No detected groundwater contamination

Site 10: J-58 Test Cell

- Oil and grease, petroleum hydrocarbons, BETX, and solvents detected previously in shallow soils
- o No detected groundwater contamination

- Site 14: Transformer Drainage Pit
 - o Oil and grease detected in two shallow soil samples, PCB detected in one shallow soil sample
- Site 4: Battery Shop Dry Well
 - o Low pH (3.6) in one soil sample
 - o No detected groundwater contamination
- Site 9: Entomology Building 2560
 - o Single chlordane detection in shallow soil (Phase II, Stage 1) not confirmed in Stage 2-1
 - o Curbed concrete cap has been placed over rinse area
 - o Isolated contamination, low use area

4.2.2 Definition of Operable Units

EPA defines an operable unit as "A discrete part of a remedial action that can function independently as a unit and contributes to preventing or minimizing a release or threat of release." For the IRP, the operable units are the individual sites of concern (as opposed to media-specific operable units). For the most part, the sites are relatively independent and can be addressed separately. In some cases, evaluations may need to consider multiple sites because of waste-stream connections or proximity of sites.

Sites 1, 5, and 21 are considered an operable unit. Fuel hydrocarbons from Sites 5 and 21 migrate through surface water to Site 1. The source of fuel hydrocarbons at Site 5 was fuel leakage from the SR-71 aircraft fuel tanks. Most of this fuel was retained in an oil/water separator near the head of the storm drain from the site, but some escaped and was washed into the storm drain system. The source of fuel hydrocarbons at Site 21 is minor spills or leaks near the fuel tanks. An oil/water separator or other method of retaining fuel does not exist at the head of the drainage ditch from Site 21. Fuel hydrocarbons are carried from Site 21 downstream towards Site 1.

Surface water from Sites 5 and 21, and the flightline in general, is channelled into three 66-inch diameter corrugated metal pipes (CMP). Water in these pipes flows to the

west and discharges through a concrete headwall at Site 1. It is likely that any attenuation of TFH from the surface water is by adsorption onto soil lining the ditch. This is evidenced by the TFH-diesel and -gas detected in ditch soil samples collected at Site 21 and downstream of the headwall at Site 1. Conclusive evidence about the nature of fuel hydrocarbon adsorption onto natural sediments occurring in the West Side Drainage ditch were not available. Literature reviewed (AFESC, 1981a and AFESC, 1981b) indicated that adsorption characteristics were dependent on clay mineralogy and hydrocarbon type. The literature did indicate that nonpolar compounds adsorbed onto clay will be released to the water with the sediments acting as a source when the relative TFH concentrations in water is lower than that in the sediments.

The source of TCE contamination in groundwater at Sites 1 and 5 or the TFH-gas at Site 21 is not known. These source(s) may be located both in the flightline area and at Site 1. No TCE or TFH was detected in the background well at Site 1, but TCE was detected in three shallow downgradient wells at Site 1. TCE was not detected in two deep downgradient wells at Site 1. TCE was only detected in the third quarter at Site 5 in the southern well (5-C-1) at 66 ug/1. TFH was only detected in the first round at 0.20 mg/1 at Site 21. The TFH-gas source at Site 21 may be from a spill or from any individual or combination of underground tanks or piping in the flightline area.

Other groups of IRP sites at Beale AFB are closely grouped, but are not interpreted to act as operable units. Sites 2, 13, and 20, though in effect surrounding each other (Site 2 encompasses Sites 13 and 20), have had completely independent waste streams. Groundwater sampled from Site 13 had detected TCE which indicates that TCE contamination is widespread at low concentrations in that area, but the source is unknown. Because of the proximity of these sites they could, however, be considered as an operable unit with respect to groundwater mitigation.

The area of Site 22, although categorized as a single site for IRP purposes, actually encompasses several other IRP sites. If a portion of the tanks indicated on the Camp Beale plans leaked fuel either during or after their active use, they could constitute a widespread hydrocarbon source. Because of the large area and small potential point sources, Site 22 is, by itself, considered an operable unit. At the conclusion of Stage 2-1 monitoring well installation, no monitoring wells were situated downgradient from most of the

area comprising Site 22. Therefore little groundwater data are available to assess whether abandoned tanks at Site 22 have impacted the groundwater.

4.2.3 Identification of Additional Data Needs with Further Remedial Investigations

Discussion is provided in this section, in the proposed rank order described in Section 4.2.1, of additional data required to further define the nature and extent of contamination at specific IRP sites on Beale AFB. The additional data are necessary before accurate evaluation of remedial actions or risk assessment can be completed. However, preliminary consideration (or exclusion) of some remedial action alternatives and preliminary risk assessment activities may be initiated based on the available data. As remedial actions are considered and risk assessment progresses, additional data needs may become evident.

The recommended actions for Beale AFB IRP sites are:

Site 13: Landfill No. 1

- o Sampling and analysis of water from the domestic well (about 2,200 feet to the west) has been conducted. The domestic well water was found to contain TCE. Water samples should continue to be collected periodically from water faucets or hose bibs at the residence. Beale AFB has provided drinking water to the residents supplied by this domestic well since August 1990.
- Additional monitoring wells are required to fur-0 ther delineate the upgradient, lateral, vertical, and downgradient extent of the TCE plume. A background well should be located east of the wastewater treatment plant. Three to five additional monitoring wells should be positioned laterally and downgradient of existing wells (Sites 2, 13, and off base well) which have had TCE detected. Two new deep monitoring wells should be installed immediately outside the landfill downgradient of 13-C-1 to form a three well cluster. They should be screened in the next two lower permeable zones below where 13-C-1 is screened to evaluate the vertical extent of contamination and the vertical groundwater gradient.

o Monitor existing groundwater wells for purgeable hydrocarbons, volatile aromatics, and fuel hydrocarbons.

Site 1: West Drainage Ditch

- O Cease discharge of fuel hydrocarbons to the stream water. Beale AFB has reduced discharge of fuel hydrocarbons significantly with the Flightline Drainage Upgrade Project which will be completed in January 1991. The outfall structure at Site I has been upgraded to include a cement apron and weir which will detain floating petroleum products.
- o Sample and analyze the base water supply wells for purgeable halocarbons, purgeable aromatics, and fuel hydrocarbons to determine if contamination has affected the Beale AFB water system.
- o Install and sample additional downgradient groundwater monitoring wells to define the extent of the plume and to assess proximity of the TCE plume to the base water supply wells.
- o Additional downstream sediment sampling to determine the approximate boundary of sediment contamination with TFH.
- o Additional sediment sampling at greater depths than conducted in Stage 2-1 to determine the approximate lower boundary of soil contamination beneath the stream bed.
- Monitor existing groundwater wells.

Site 2: Photo Wastewater Treatment Plant

- o Monitor existing groundwater wells.
- o The photo laboratory now has a closed loop water system and no longer discharges to the PWTP which is being decommissioned. Beale AFB discontinued use of the sludge ponds in April 1990. Beale is going through RCRA closure for the ponds under a Federal Facilities Compliance Agreement with the USEPA.

Site 5: SR-71 Shelters Draining Area

- Further reduce discharge of fuel products to the surface water system. As part of the Flightline Drainage Upgrade Project, Beale has modified the oil/water separator and associated berms at Site 5 to more effectively capture runoff from a larger area. Oil absorbent booms have been installed around the oil/water separator. The SR-71 aircraft were removed from Beale AFB in 1990, which reduces discharge of fuel products.
- o Sample existing wells and analyze for purgeable aromatics and halocarbons in addition to the fuel hydrocarbons because it is known that compounds detected in groundwater at Site I have been used in the flightline area. Additional sampling may confirm the TCE found in one groundwater sample at Site 5.
- o Install and sample a background (upgradient) well to estimate the upgradient extent of groundwater contamination.
- Site 21: JP-7 Above Ground Fuel Storage Tanks
 - o Monitor existing groundwater well.
 - Auger borings along the ditch to determine lower bounds of TFH contamination.
- Site 3: Fire Protection Training Area
 - o Monitor existing groundwater wells.
 - Auger boring to groundwater in FPTA No. 1 to determine vertical extent of soil contamination.
 - Auger boring to groundwater at underground storage tanks to determine vertical extent of soil contamination.
- Site 18: Bulk Fuel Storage Area
 - o Install background (upgradient) well.
 - o Monitor existing groundwater wells.

- Auger borings below the bermed tank areas and along the railroad tracks near 18-C-1SB, -2SB, and -3SB to determine lower bounds of TFH and heavy metal contamination. Borings below the tank areas should be located near the highest concentrations in surface soil samples.
- Site 23: Ninth Transportation Refueling/Maintenance Shop
 - o Continue to reduce discharge of fuel hydrocarbons to surface water.
 - o Conduct additional groundwater sampling and analysis for purgeable halocarbons, semivolatile organics, and fuel hydrocarbons.
 - o Determine areal extent of soil contamination beneath pavement by 20-foot-deep soil borings.
- Site 6: Landfill No. 2
 - o Install and sample one additional downgradient (west side of site) monitoring well.
 - o Monitor existing groundwater wells.
- Site 19: Photo Waste Emergency Holding Basin
 - o File TPCA exemption request.
 - o Either close the EHB, or if it is to remain for occasional use, remove clay and install impermeable (synthetic) liner. The EHB is currently not in use as the photographic laboratory now has a closed loop water treatment system.
 - o Monitor existing groundwater wells.
- Site 24: Landfill No. 4
 - o Auger angled soil borings beneath the exposed trench.
 - o Install downgradient (west side of site) monitoring wells.

Site 15: Landfill No. 3

- o Monitor groundwater as required by landfill permit.
- o No further IRP action.

Site 20: Grease Pit

- o Coordinate remedial actions with other operable unit Sites 2 and 13.
- o No further IRP action.

Site 16: Explosive Ordnance Disposal Area

- o Monitor groundwater in existing well.
- o Install two additional monitoring wells positioned to determine groundwater flow direction at the site. One well should be located northwest of the trench and the other south of the trench.
- No further IRP action.

Site 11: Aircraft Ground Equipment Maintenance Area

- o Monitor groundwater in the existing well.
- o No further IRP action.

Site 8: J-57 Test Cell

- o Conduct additional soil sampling to determine vertical and lateral extent of soil contamination.
- o Investigate existing well (which had no water in it during the Stage 2-1 investigation despite a general rise in water levels in the flightline area) and monitor groundwater. Install a new well if necessary.

Site 10: J-58 Test Cell

- o Conduct additional soil sampling to determine lateral and vertical extent of soil contamination.
- o Monitor existing well.

- Site 14: Transformer Discharge Pit
 - o Drill one soil boring to determine vertical extent of contamination.
- Site 4: Battery Shop Dry Well
 - o Monitor groundwater to serve as upgradient data for flightline.
 - o Backfill or cap dry well.
 - o No further IRP action.
- Site 9: Entomology Building 2560
 - o No further IRP action.
- Site 22: Abandoned Underground Storage Tanks
 - Excavate at all UST locations that indicate positive or tentative buried metal detections. Use of a magnetometer may facilitate more precise field location of where to dig.
 - o Remove any tanks discovered in the excavation operation.
 - o Sample and analyze soil beneath any tanks.
 - o Beale AFB has removed 21 post Camp Beale tanks and achieved soil cleanup in the area south of Warren Shingle Boulevard from A to C Streets prior to construction of a navigation school.
 - On the basis of "potholing" program, evaluate the need to investigate additional Camp Beale tanks (tanks not included in Stage 2-1).
- Site 7: Army Biological Production Area
 - o No further IRP action.
- Site 12: Entomology Building 440
 - o No further IRP action.
- Site 17: Best Slough
 - o No further action.

V. ALTERNATIVE REMEDIAL MEASURES

Feasibility studies to determine remedial alternatives were not included in the scope of Stage 2-1 activities. Some of the IRP sites at Beale AFB have previously, or are currently being recommended for no further action. These sites have not undergone a feasibility study. They are recommended for no further action based on a lack of evidence of environmental impacts. Sites recommended for no further action and sites recommended for additional IRP activities are discussed in Section VI.

VI. RECOMMENDATIONS

6.1 CRITERIA FOR RECOMMENDATIONS

Previously presented in Section 4.2 is a prioritization of Beale IRP sites for future actions. This prioritization was conceptually based on the presence or absence of contaminants, the potential migration pathways, comparison of contaminant concentrations to ARARs, proximity to potential receptors, and other criteria. Also included in Section 4.2 are generalized recommended actions for the IRP sites.

The discussion of recommendations in this section is based on the level of understanding of the nature and extent of contamination at each site and, therefore, whether additional investigations are necessary in accordance with the RI/FS process described in Section I. Recommendations are made on a site specific basis, in the order of site numbering, not the prioritized order presented in Section 4.2.

Recommendations fall into one of three categories: Category 1, sites requiring no further action; Category 2, sites requiring further actions in the form of additional remedial investigation, risk assessment, or feasibility study; and Category 3, sites for which a remedial action has been selected.

At this time, the majority of sites at Beale AFB (19 of 24) are Category 2 sites, even though several sites have apparently limited contamination either by areal extent or by concentrations compared to ARARs. It is probable that many of these sites would have been Category 1 sites if risk assessment activities had been included as part of Stage 2-1. However, because no risk assessment activities have been conducted, these sites cannot be recommended for no further action. In addition to Sites 7, 12, and 17, which were identified as no action sites in previous studies, Site 9 (Entomology Building 2560) and Site 20 (Grease Pit) have been added to the no action list.

None of the Beale AFB IRP sites are Category 3 sites at this time. Feasibility studies have not been initiated and, therefore, no remedial actions have been selected. Most of the sites for which additional actions have been recommended have had sufficient data collected to begin the feasibility study process. Additional data will probably need to be collected, but this can be accomplished as part of the FS process.

Table 6-1 presents the 24 IRP sites and the current recommended categorization for each site. Recommendations are further discussed in the following subsection on a site-specific basis.

6.2 SITE-SPECIFIC RECOMMENDATIONS

6.2.1 SITE 1: WEST DRAINAGE DITCH

Site 1 is a Category 2 site; additional activities needed. It is also considered to be in an operable unit with Sites 5 and 21. Therefore actions taken at Site 1 should be coordinated with activities at the other two sites.

Additional remedial investigation activities are required to further define the extent of groundwater contamination, to define the depth to which ditch sediments have been impacted, and the downstream distance of these impacts in surface water and sediments.

Groundwater monitoring needs to continue in order to establish whether TCE contamination is above or below state action levels. Previous studies detected TCE above the action level but, Stage 2-1 samples from the first round of sampling detected TCE at approximately the action level.

A preliminary risk assessment (RA) needs to be completed which addresses the contamination present in sediments, surface water, and groundwater. The results of this risk assessment should be used to help define the level of information still needed.

A preliminary feasibility study should be initiated to determine potentially feasible alternatives for mitigation of contamination at the site. The FS should also be used to help define the level of additional activities.

The most important recommendation at this time for Site 1 is to continue to work toward cessation of discharge of contaminants to the ditch. Until this occurs, contamination impacts at the site cannot be adequately defined and final site mitigation is not possible. The base should continue to address the handling of contaminated stormwater from the flightline areas, including collection, treatment, and disposal options. Beale AFB has reduced discharge of fuel hydrocarbons significantly with the Flightline Drainage

Table 6-1 RECOMMENDED ACTIONS

	SITE	Recommendation ^a <u>Category</u>	Recommended ^b <u>Stage 2-2 Actions</u>
*1.	West Drainage Ditch	2	RI/M/RA/FS
**2.	Photowaste Water Treatment Plant, Injection Well, and Sludge Basins	2	M/RA/FS
3.	Fire Protection Training Areas	2	RI/M/RA/FS
4.	Battery Shop Dry Well	2	М
* 5.	SR-71 Shelters Drainage Area	2	M/RA/FS
6.	Landfill No. 2	2	M/RA
7.	Army Biological Production Area	1	NO ACTION
8.	J-57 Test Cell	2	RI/M
9.	Entomology Building 2560	1	NO ACTION
10.	J-58 Test Cell	2	RI/M/RA
11.	Aircraft Ground Equipment Maintenance Area	2	M/RA
12.	Entomology Building 440	1	NO ACTION
**13.	Landfill No. 1	2	RI/M/RA/FS
14.	Transformer Drainage Pit	2	RI
15.	Landfill No. 3	2	М
16.	Explosive Ordnance Disposal (EOD) Area	2	RI/M
17.	Best Slough	1	NO ACTION
18.	Bulk Fuel Storage Facility	2	RI/M
19.	Photowaste Emergency Holding Basin	2	M
**20.	Grease Pit (Sanitary Treatment Plant)	1	NO ACTION
*21.	JP-7 Aboveground Fuel Storage Tanks (Flightline)	2	RI/M
22.	Abandoned Underground Storage Tanks	2	RI
23.	Ninth Transportation Refueling/ Maintenance Shop	2	RI/M
24.	Landfill No. 4	2	RI

Sites 1, 5, and 21 are considered an operable unit and all actions taken on these sites should be coordinated.

Category 1: No Further Action.

Category 2: Additional Activities Needed. The activities may include Remedial Investigation, Monitoring, Risk Assessment or Feasbility Study.

RI: Remedial Investigation

M : Monitoring

RA: Risk Assessment FS: Feasibility Study

^{**} Sites 2, 13, and 20 are not considered an operable unit but are in geographic proximity. Some actions taken at these sites may be coordinated.

Upgrade Project which will be completed in January 1991. The outfall structure at Site 1 has been upgraded to include a cement apron and weir which will detain floating petroleum products.

6.2.2 SITE 2: PHOTO WASTEWATER TREATMENT PLANT

Site 2 is a Category 2 site; additional activities needed. Site 2 is in proximity to Sites 13 and 20 and, although these sites are not considered an operable unit, actions taken at Site 2 should be coordinated with activities at the other two sites. The PWTP is no longer used and is being decommissioned. The photo laboratory now has a closed loop water treatment system and does not discharge to the PWTP.

No additional RI activities are recommended for Site 2 at this time. Wastes, surface spill areas, and subsurface soils have been sufficiently characterized to allow feasibility studies to begin.

Monitoring of groundwater needs to be continued to establish a pattern of contamination. This should be accomplished in coordination with groundwater monitoring at Site 13.

A preliminary risk assessment should be completed to evaluate contaminants present in the groundwater, sludge, and soil. The risk assessment results should be used to help define the level of groundwater data needed and whether or not additional activities need to be taken at the sludge ponds, spill areas, or injection well heads.

A preliminary feasibility study needs to be initiated to determine potentially feasible alternatives for mitigation, if necessary, of sludge, soil contamination, and groundwater contamination. The FS should also be used to help define the level of additional activities.

Based on the results of sludge sampling and analysis during Stage 2-1, the base has fenced the sludge ponds to restrict access by personnel and non-avian wildlife. Until the risk assessment and FS have been completed, it is recommended that this controlled access be continued and that exposure to soils and fugitive dust in the area of the plant be minimized as an added precaution. Beale AFB discontinued use of the sludge ponds in April 1990, and is going through RCRA closure for the ponds under a Federal Facilities Compliance Agreement with the USEPA.

6.2.3 SITE 3: FIRE PROTECTION TRAINING AREA

Site 3 is a Category 2 site; additional activities needed.

For FPTA No. 1, contamination as detected through the total sampling depth of approximately 20 feet BGS. Additional sampling needs to be conducted to determine the vertical extent of the contamination. At FPTA No. 2, contamination appears to be limited to near surface depths and additional remedial investigation does not appear to be warranted at this time. The overflow basin area had mercury detected to the total depth of sampling but additional sampling is not necessary at this time. Contaminants were also present in the deepest samples collected at the underground storage tank area. Additional sampling below this depth (approximately 50 feet BGS) will be necessary. It is possible, however, that the actual depth below 50 feet to which contaminants extend may have no effect on the feasible alternative selection, especially since no groundwater contamination has been detected to date.

Groundwater monitoring at Site 3 should be continued. Soils have been impacted at the site and it is reasonable to assume that there is potential for groundwater contamination even though it has not been detected to date.

Risk assessment activities should be initiated for Site 3. Contaminants are present but may not be entering exposure pathways other than exposure to personnel training at the site. Risk assessment linked to feasibility study will determine if soil mitigation actions are necessary and, if so, what actions are most appropriate. Risk assessment should also be used to help determine if additional activities are necessary.

Preliminary feasibility studies should be initiated to determine potential remedial alternatives for impacted soil. The FS should also be used to help determine if additional activities are necessary.

At a minimum, the base should consider removal of the underground storage tanks at Site 3. This should also include associated piping which may be a contributing source of soil contaminants. If the base elects to remove the underground storage tanks in the near future, recommended sampling of soils below the 50-foot depth can be completed after tank removal, in conjunction with soil sampling from immediately

below the tanks. By this method, the locations of leaks (if present) can be pinpointed and a deep boring can be drilled at the point of highest contamination.

If this is accomplished, the base should consider whether it is environmentally and economically preferable to replace the tanks, change to above-ground tanks, or eliminate tanks at the site. If the site is going to be used for fire training in the future, the base should consider site modifications and/or procedural changes that will help minimize potential impacts.

6.2.4 SITE 4: BATTERY SHOP DRY WELL

Site 4 is a Category 2 site; additional activities needed.

No further remedial investigation activities are recommended for Site 4. Potential contamination appears to be minimal in soils and has not been detected in groundwater to date.

Monitoring of groundwater from the one well at Site 4 is recommended, not so much to look for contaminants entering the groundwater from Site 4, but to serve as an upgradient well for the flightline area.

Although the dry well is no longer used as a disposal site, the base should consider abandonment of the dry well. Although various abandonment alternatives need to be considered, it is proposed that this be accomplished without the formal risk assessment/feasibility study process.

6.2.5 SITE 5: SR-71 SHELTERS DRAINAGE AREA

Site 5 is a Category 2 site; additional activities needed. It is also considered to be in an operable unit with Sites 1 and 21. Actions taken at Site 5 should be coordinated with actions taken at the other two sites.

No further remedial investigation activities are recommended for Site 5 at this time other than the installation of an appropriate background well. Soil contamination has been adequately characterized to initiate risk assessment and FS activities.

Groundwater monitoring at the site is recommended, including the installation of a background well to determine upgradient groundwater conditions. Contaminants were detected in the groundwater at this site (TCE in well 5-C-1), and also exist in the groundwater at the other operable unit sites (Sites 1 and 21). Additional data are needed to establish contaminant concentrations versus action levels. If ground-water contamination is confirmed through monitoring, additional wells may be needed to define the extent of the contamination.

Risk assessment activities should be initiated in coordination with the other operable unit sites. RA results should be used to help determine if additional activities are needed.

Preliminary feasibility study activities should also be initiated in coordination with other operable unit sites. FS results should help define if additional data are needed.

As with Site 1, the most important recommendation is to continue to minimize discharge of contaminants. This will prevent further impacts to the soil and eliminate one source of contamination entering the storm drain that discharges at Site 1. The base should continue to improve methods of handling, treating, and disposing of contaminated stormwater and fuel leakage from the shelters. As part of the Flightline Drainage Upgrade Project, Beale has modified the oil/water separator and associated berms at Site 5 to more effectively capture runoff from a larger area. Oil absorbent booms have been installed around the oil/water separator. The SR-71 aircraft were removed from Beale AFB in 1990, which reduces discharge of fuel products.

6.2.6 SITE 6: LANDFILL NO. 2

Site 6 is a Category 2 site; additional activities needed.

Additional groundwater monitoring is recommended, even though contamination has not been detected to date. This is because there is a potential for landfill leachate to enter the groundwater. As part of this monitoring it is recommended that an additional downgradient well be installed north of well 6-A-1 and monitored.

A risk assessment for this site should be initiated and used to help determine if additional data are needed or if a feasibility study should be conducted. If the landfill has been closed in an appropriate manner, it may be determined that no additional activities other than monitoring are needed.

6.2.7 SITE 7: ARMY BIOLOGICAL PRODUCTION AREA

Site 7 is a Category 1 site; no further action. It was determined at the conclusion of Phase II, Stage 1 that no further actions were required for Site 7 because no contaminants were detected. A No Further Action Decision Document has been prepared and is given in Appendix J of this report.

6.2.8 SITE 8: J-57 TEST CELL

Site 8 is a Category 2 site; additional activities needed.

No activities were conducted at Site 8 during Stage 2-1. Previously, contaminants were detected in soils and it was recommended that additional remedial investigation activities be conducted to determine the extent of contamination.

Groundwater contamination was not detected during the previous investigation. However, during Stage 2-1, water level measurements were attempted at Site 8 on a quarterly basis. On each occasion, the existing well was found to be dry. Because groundwater levels at the base are generally rising, this makes the sampling of the well during previous investigations suspect. This well should be modified or a new well drilled in order to provide appropriate groundwater samples. Monitoring needs to be conducted to determine if impacts exist.

Although risk assessment activities could be initiated with available information, the data are so limited that it would be advantageous to conduct the RA after additional sampling and analysis.

6.2.9 SITE 9: ENTOMOLOGY BUILDING 2560

Site 9 is a Category 1 site; no further action.

No further remedial investigation activities are recommended for Site 9 because Stage 2-1 did not detect contaminants reported during previous studies.

Because the existence of contaminants could not be confirmed, it is proposed that a no action decision document be prepared for the site. 6.2.10 SITE 10: J-58 TEST CELL

Site 10 is a Category 2 site; additional activities needed.

No activities were conducted at Site 10 during Stage 2-1. Previously, contaminants were detected in soils and it was recommended that additional remedial investigation activities be conducted to determine the extent of contamination.

Groundwater contamination was not detected during the previous investigation, but monitoring needs to be conducted to confirm this finding.

Although risk assessment activities could be initiated with available information, the data are so limited that it would be preferable to conduct the RA after additional sampling and analysis.

6.2.11 SITE 11: AIRCRAFT GROUND EQUIPMENT MAINTENANCE AREA

Site 11 is a Category 2 site; additional activities needed.

No further remedial investigation activities are currently recommended for Site 11. Soil contamination has been adequately characterized and groundwater contamination has not been detected to date.

Groundwater monitoring is recommended, even though contamination has not been detected, primarily to provide groundwater data upgradient of the flightline area. Although groundwater contamination has not been detected to date, the Air Force may want to consider installing and sampling a well downgradient at Site 11.

Risk assessment activities should be conducted and used to determine if additional data need to be collected and if remedial actions need to be considered.

As with the other active sites on base, it is recommended that the base continue to consider ways to minimize ongoing or potential impacts.

6.2.12 SITE 12: ENTOMOLOGY BUILDING 440

Site 12 is a Category 1 site; no further action. It was determined at the conclusion of Phase II, Stage 1 that no further actions were required for Site 12 because no con-

taminants were detected. A No Further Action Decision Document has been prepared and is given in Appendix J of this report.

6.2.13 SITE 13: LANDFILL NO. 1

Site 13 is a Category 2 site; additional activities needed. Although not considered part of an operable unit, this site is in proximity to Sites 2 and 20. Any actions taken at Site 13, especially those related to groundwater, should be coordinated with actions at the other two sites.

Additional remedial investigation activities need to be initiated at Site 13 as soon as possible. Near the area of highest groundwater contamination, contaminants were detected in soils beneath a landfill trench. Additional soil investigation is not recommended at this time but, additional study of the wastes and soils may be required after initial risk assessment and feasibility study steps. Exploration into the landfill trenches is not recommended at this time because of safety concerns and the possibility that additional contaminants may be released to the subsurface.

Groundwater in the area is contaminated with chlorinated solvents at concentrations up to 300 times the state action The extent of the groundwater contamination is not known and potential receptors are approximately 2,000 feet downgradient. Monitoring well 13-C-6 was installed approximately 1,000 feet downgradient from Site 13 and contained TCE at concentrations slightly above state action levels. Additional groundwater monitoring wells need to be installed downgradient from the site to determine the horizontal and vertical extent of contamination. Two deep monitoring wells should be drilled immediately downgradient of 13-C-1 and screened in the next two lower permeable zones below where 13-C-1 is screened. This will form a three well cluster at the point of highest detected contamination and provide data on vertical groundwater gradients. An additional upgradient well should also be installed because existing upgradient wells all contain contaminants.

In addition to new monitoring wells, existing monitoring wells need to be monitored to establish area-wide concentrations and variations of contaminants. Many of the areas away from the highest contamination location have contaminants near the state action levels.

Off base domestic supply wells downgradient from Site 13 have been sampled and contaminants similar to those at Site 13 were identified in one of the two wells sampled. This monitoring needs to be continued, a well inventory for off

base wells should be conducted, and other local wells considered for inclusion in the monitoring. Since August 1990, the USAF has provided drinking water for residences where contaminants have been detected.

Risk assessment activities should be initiated for Site 13. Although additional data regarding the extent of contamination needs to be collected, sufficient data are available to perform preliminary RA. The results of the RA should be used to help define additional data collection needs.

A feasibility study should also be initiated for Site 13. Sufficient information exists to begin evaluation of waste and soil contamination mitigation. Feasibility study activities can also be started for the groundwater. Although the extent is not fully known, sufficient information is available to preliminarily evaluate mitigation alternatives. The results of the FS should be used to determine if additional remedial investigation activities are needed, especially with respect to wastes and soils.

6.2.14 SITE 14: TRANSFORMER DRAINAGE PIT

Site 14 is a Category 2 site; additional activities needed.

No activities were conducted at Site 14 during Stage 2-1. Previously, contaminants were detected in soils and it was recommended that additional remedial investigation activities be conducted to determine the vertical extent of contamination. Because the horizontal extent of contamination had been adequately characterized in previous studies, one boring through the area of known contamination should be adequate to estimate vertical extent. Some soil was removed by Beale AFB in 1990, and the berms around the site taken down.

If contamination is confirmed to be restricted to a very small area, it is possible that a risk assessment and feasibility study of the site may not be necessary.

6.2.15 SITE 15: LANDFILL NO. 3

Site 15 is a Category 2 site; additional activities needed.

No additional remedial activities are recommended at this time other than ongoing monitoring. The site has been adequately characterized, and contamination has not been identified. Additional groundwater monitoring is recommended, even though contamination has not been detected to date. This is because the site is an active disposal facility, there is a potential for landfill leachate to enter the groundwater, and monitoring is part of the activities required under the operating permit.

Because this site is an active disposal facility for non-hazardous wastes and is subject to State of California permits, and because no significant contamination has been identified in the subsurface, it is proposed that this site be removed from the IRP list without further risk assessment or feasibility study. The fact that this site is permitted to accept only non-hazardous wastes and contamination has not been identified means that the IRP/CERCLA approach is probably not applicable to this site.

6.2.16 SITE 16: EXPLOSIVE ORDNANCE DISPOSAL AREA

Site 16 is a Category 2 site: additional activities needed.

Additional remedial investigation activities are recommended in the form of installation of two additional wells and groundwater monitoring. Soil in the trench contains various metals, but the bottom of the trench is close to bedrock and additional vadose zone characterization would not be practical. However, only one well currently exists at the site and the direction of groundwater flow is not known. Additional wells are needed to determine groundwater flow direction and to confirm the TFH-gas and explosive compounds found in the fourth quarter.

6.2.17 SITE 17: BEST SLOUGH

Site 17 is a Category 1 site; no further action.

At the end of Phase II, Stage 1, it was concluded that no further action was needed at this site. State regulatory agencies requested a geophysical scan of the area, which was completed during Stage 2-1. The geophysical survey did not locate buried drums and, therefore, no further action is recommended. A No Further Action Decision Document has been prepared and is included in Appendix J of this report.

6.2.18 SITE 18: BULK FUEL STORAGE FACILITY

Site 18 is a Category 2 site; additional activities needed.

Additional remedial investigation activities are needed to determine the depth of soil contamination under the tank farms and at the railroad siding. Borings should be drilled in areas of highest surface soil contamination to determine vertical extent.

Installation of an upgradient background well and a second downgradient well for the AVGAS tanks (north of the present well) is needed. Groundwater monitoring should continue at these wells because potential exists for contaminants to enter the groundwater.

Additional data are required before risk assessment and the feasibility study can be adequately addressed.

As with other active facilities on base, it is recommended that the base continue to evaluate and implement handling procedures to help minimize ongoing or potential contamination.

6.2.19 SITE 19: PHOTO WASTE EMERGENCY HOLDING BASIN

Site 19 is a Category 2 site; additional activities needed.

No further remedial investigations are recommended at this time. The EHB is currently not in use. The photo laboratory now has a closed loop water treatment system and no longer discharges to the PWTP or the EHB. Soils within the basin have been characterized, and soil sampling beneath the basin encountered contamination inconsistently and at or near detection limits. Groundwater samples from the site did contain contamination in the form of TCE and carbon tetrachloride. These compounds are not known to be part of the waste stream previously held in the basin and, therefore, may be from some other source. Additional wells southeast of the site should be installed to better define groundwater flow paths and the vertical and horizontal extent of groundwater contamination in the area.

Groundwater monitoring is recommended because the basin does contain some contaminant components, and migration to groundwater is a possibility.

The base should also apply to the Regional Water Quality Control Board for an exemption from the Toxic Pits Cleanup

Act on the basis that the basin does not contain hazardous wastes.

6.2.20 SITE 20: SANITARY TREATMENT PLANT GREASE PIT

Site 20 is a Category 1 site; no further action. Although this site is not considered part of an operable unit, it is in proximity to Sites 2 and 13. Monitoring actions taken at the other two sites should be sufficient to monitor groundwater in the vicinity of Site 20.

No further remedial investigation activities are recommended for Site 20. Contaminants were detected in the pit but not in the soils beneath the pit.

Groundwater monitoring in the area of Site 20 is recommended because TCE has been detected throughout the area. This monitoring can, however, be accomplished in conjunction with Sites 2 and 13.

The base should consider other methods to dispose of the sanitary treatment plant grease skimmings. If another method is implemented, a feasibility study should be conducted to determine the most appropriate closure method.

6.2.21 SITE 21: JP-7 ABOVE GROUND FUEL STORAGE TANKS (FLIGHTLINE)

Site 21 is a Category 2 site; additional activities needed. This site is also considered part of an operable unit with Sites 1 and 5. Any actions taken at Site 21 should be coordinated with actions at the other two sites.

Additional remedial investigation activities are recommended at Site 21 to determine the depth of soil contamination. Additional groundwater monitoring for both TFH and volatile organic (8010/8020) compounds should be conducted as TFH-gas was detected in the first round sample and the well is downgradient from the flightline area where fuels and volatile organic chemicals are used. Because groundwater contamination may have originated from underground storage tanks in the area, it is recommended that new monitoring wells be installed not just at Site 21, but also along the flightline area where underground tanks are located.

Groundwater monitoring should continue at the existing well and new wells in the area. Longer screen lengths should be considered to help assure that the static water level is maintained within the screened interval. Surface water runoff from the site and the adjacent ditch should also be sampled and analyzed to characterize contaminant loadings. Visual observation of hydrocarbon sheen was noted for surface water flowing to the site from areas to the east.

Until additional data are collected regarding the extent of contamination, initiation of the risk assessment and feasibility study are not warranted.

As with other active facilities on base, the base should continue to consider and implement methods to help minimize ongoing or potential contaminant releases.

6.2.22 SITE 22: ABANDONED UNDERGROUND STORAGE TANKS

Site 22 is a Category 2 site; additional activities needed. This "site" actually covers a substantial area of the base, including other IRP sites. As such, it is difficult to address in the typical RI/FS approach. As investigation continues for the abandoned tanks, and if contamination is encountered, this site may need to be divided into separate areas, so that specific problems can be addressed.

The next recommended step for this site is to continue to explore the locations of positive geophysical results (suspected tank locations). A magnetometer should be used to help relocate the suspected tanks and a backhoe used to determine if the tanks are actually still present. If tanks are encountered they should be removed, inspected, and the soils beneath the tanks sampled to determine if fuel hydrocarbons are present.

Beale AFB has removed 21 post Camp Beale tanks and achieved soil cleanup in the area south of Warren Shingle Boulevard from A to C Streets prior to construction of a navigation school.

After determining the status of tanks at all suspected locations identified in Stage 2-1, a determination can then be made regarding the approach for remaining suspected locations. If no abandoned tanks are encountered for the Stage 2-1 locations, additional investigations may be unnecessary. If tanks are located and impacts observed, additional studies may be warranted.

No monitoring, risk assessment, or feasibility study activities are recommended until additional information is collected.

6.2.23 SITE 23: NINTH TRANSPORTATION REFUELING/MAINTENANCE SHOP

Site 23 is a Category 2 site; additional activities needed.

Additional remedial investigation activities are recommended to define the horizontal extent of contaminants in the soil beneath the site. Stage 2-1 sampling did encounter soil contamination but this was limited to the upper 15 feet of soil. Borings drilled to approximately 20 feet should be sufficient to characterize the horizontal extent of contaminants, unless field observations indicate a need for deeper drilling.

Monitoring of groundwater should continue for both TFH and volatile organic (8010/8020) compounds. Contaminants in the soil have potential to move to groundwater and low concentrations of contaminants may be present in the groundwater at the existing well. Although groundwater contamination has not been detected to date, the Air Force may want to consider other downgradient monitoring wells as the soil is contaminated.

Risk assessment and feasibility study activities are not recommended until additional information is collected.

The recommendations given here for Site 23 may be affected by the planned construction of the base commissary. Construction should not proceed until the site, or at least the portion of the site under the proposed building footprint, has been adequately characterized and, if necessary, cleaned up. Some characterization has been conducted as part of pre-construction site studies. Results of this characterization need to be considered for future IRP actions.

6.2.24 SITE 24: LANDFILL NO. 4

Site 24 is a Category 2 site; additional activities needed.

This site was only recently added to the IRP list and a records search and site inspection was completed in Stage 2-1. Remedial investigation activities need to be initiated to determine trench locations and if the soil or groundwater beneath the site are contaminated.

Visual observation of the site confirmed that at least one trench is present. Base personnel have stated that parallel trenches may be present. It is recommended that a geophysical scan of the site be conducted to determine trench loca-

tions. Once trenches are confirmed, angled borings should be drilled under the trenches and soil samples collected and analyzed. As a first step to groundwater monitoring, two downgradient wells should be installed to the west of the trenches and monitored. These recommendations assume that, should trenches be confirmed, the site will be subject to California SWAT requirements.

No other activities are recommended until this remedial investigation is conducted.

6.2.25 BACKGROUND SAMPLING AND ADDITIONAL RECOMMENDATIONS

Background wells installed during Stage 2-1 should continue to be sampled and analyzed. A third background well should be constructed on the golf course approximately 2,000 feet southwest of BG-C-2 to better evaluate groundwater flow directions in the southern part of the base and nitrate concentrations in groundwater. Monitoring wells should be installed and sampled along the western base boundary to determine if contamination is moving off base. Additionally, all surface water flowing off the base should be sampled and analyzed on a regular basis to determine contaminant loadings, if any, and risks to potential receptors down stream.

Large diameter (6-inch casing) pump test wells should be constructed near the base boundary on the north and south parts of the base downgradient from Sites 1 and 13, respectively. Smaller diameter piezometers should be constructed nearby as observation wells with well screens at the midpoint of the pump test well screens. Long-term pump tests should be conducted at these wells to better evaluate aquifer properties in these areas. These wells could potentially be used as extraction wells later.

Community relations activities should be initiated upon or before the release of this report. A fact sheet should be prepared and distributed, information repository established at a convenient off base location, and a public meeting should be planned.

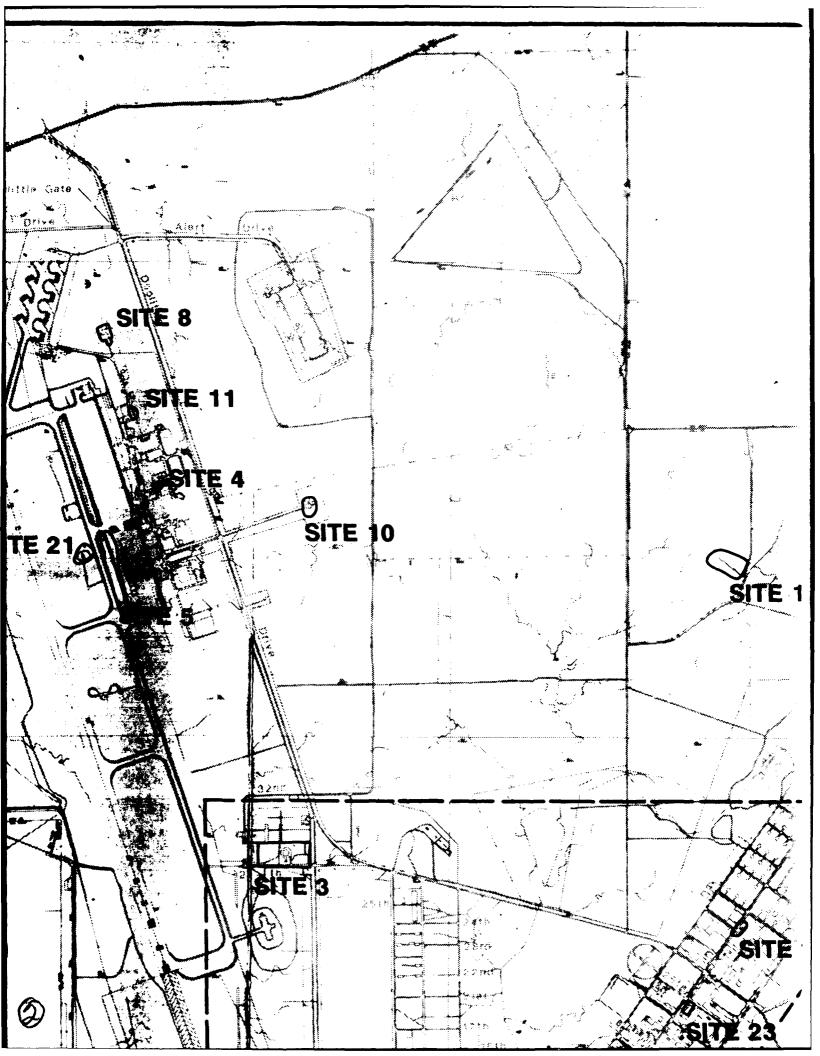
A majority of the IRP sites at Beale AFB involve fuel hydrocarbons as the primary contaminants of concern. Eventual mitigation of these sites will not be determined until risk assessments and feasibility studies are completed at the various sites. It is almost certain, however, that cleanup of hydrocarbon contaminated soils will be necessary at some of these sites. For this reason it is recommended that

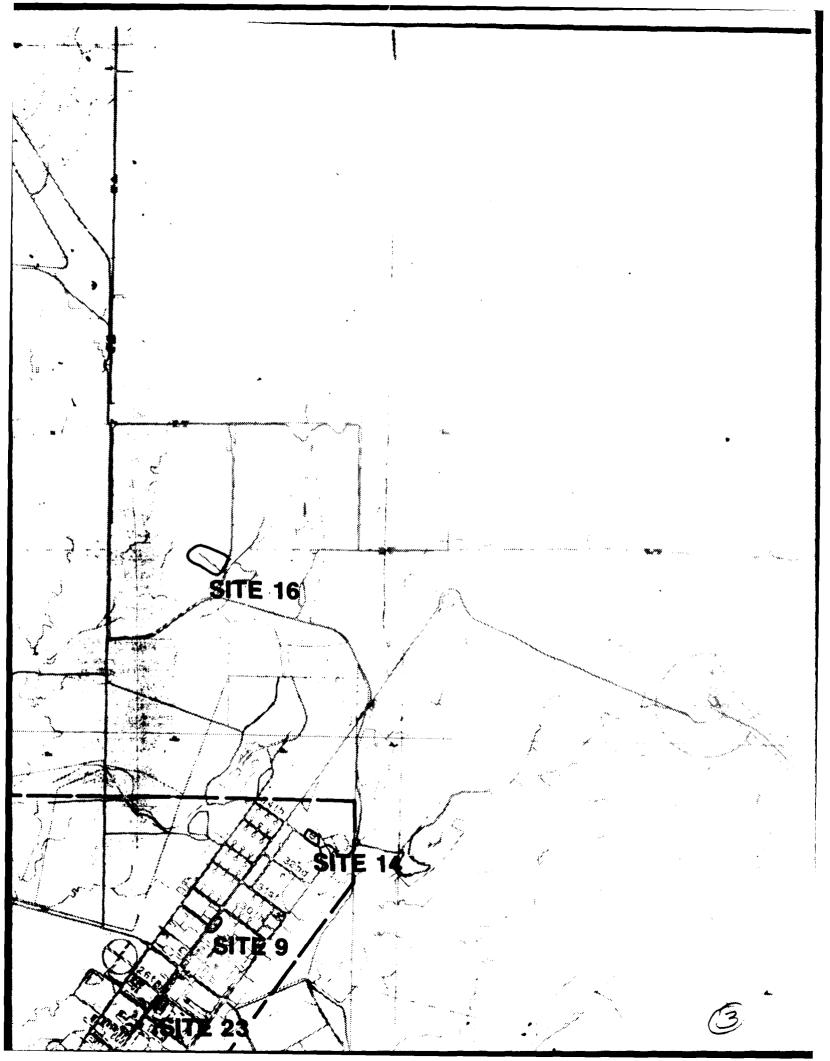
Beale AFB develop and obtain permits for a soil treatment area where hydrocarbon contaminated soils can be landfarmed to reduce the contaminant levels using biological treatment.

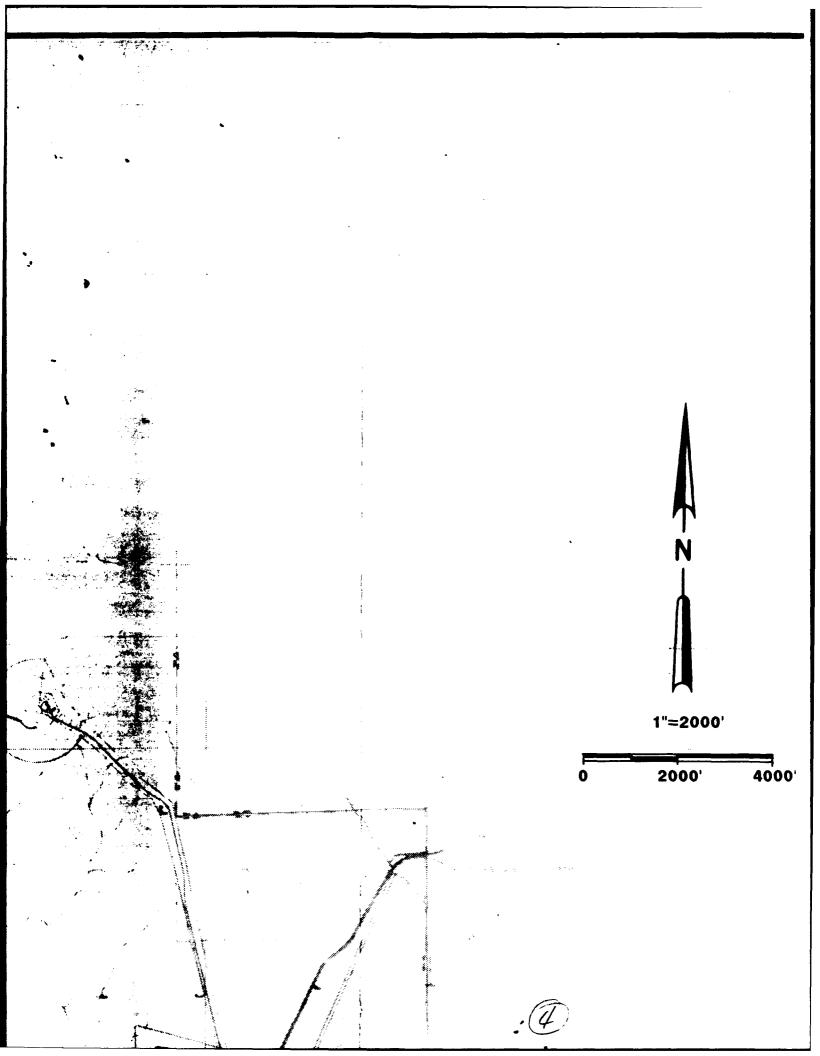
This facility would have to be specially prepared area with a liner, vadose zone monitors, a perimeter containment system, and wet weather cover, and would have to be permitted through the RWQCB and the DHS. Although this would represent an initial expenditure to construct and ongoing operation and maintenance costs, it is believed that these costs would be substantially less than other mitigation alternatives. The treatment area would also be useful not only for mitigation of existing IRP sites, but would also serve as a means to cleanup soils contaminated by future leaks and spills.

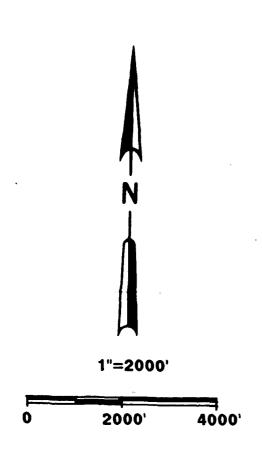
Implementation of a bio-treatment facility at Beale AFB may also be beneficial to other local bases. Mather AFB in Sacramento is scheduled for closure and may need to treat contaminated soils. McClellan AFB, also in Sacramento, may also need to treat soils but is in a more densely populated area than Beale and has much less available land area. The option of a bio-treatment facility operating at Beale AFB with soils trucked in from the other local bases should be considered if economically and technically feasible.

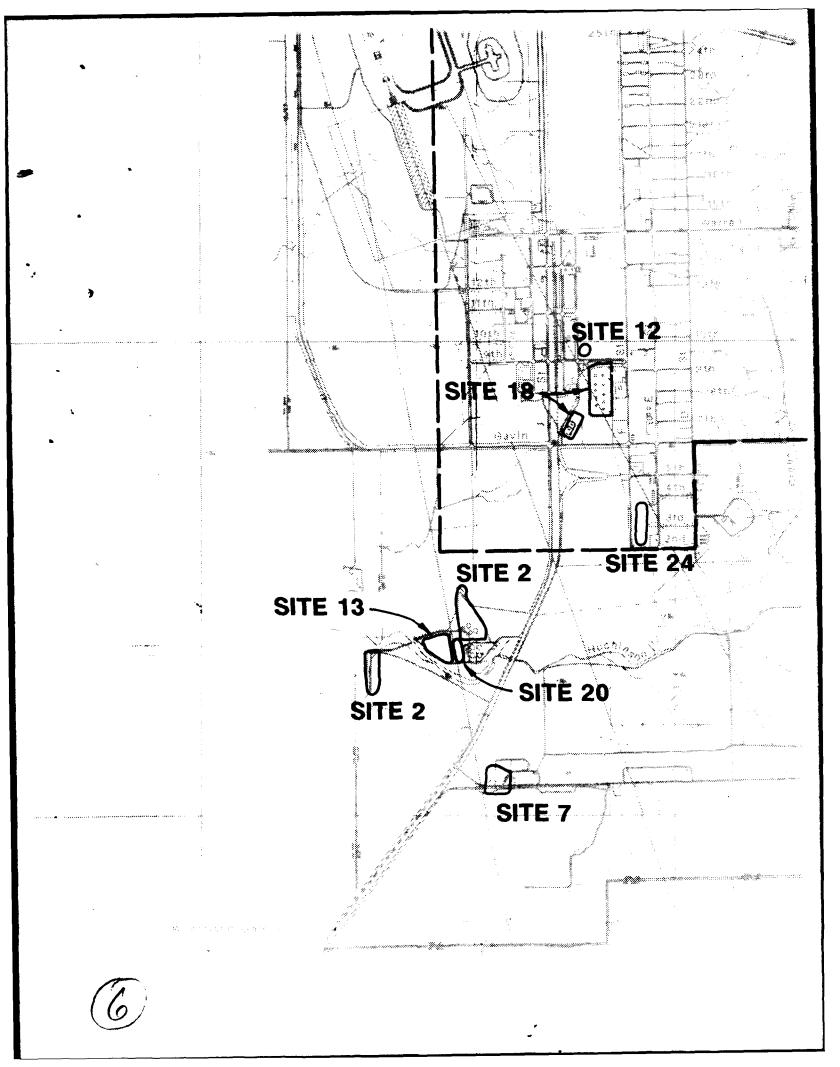
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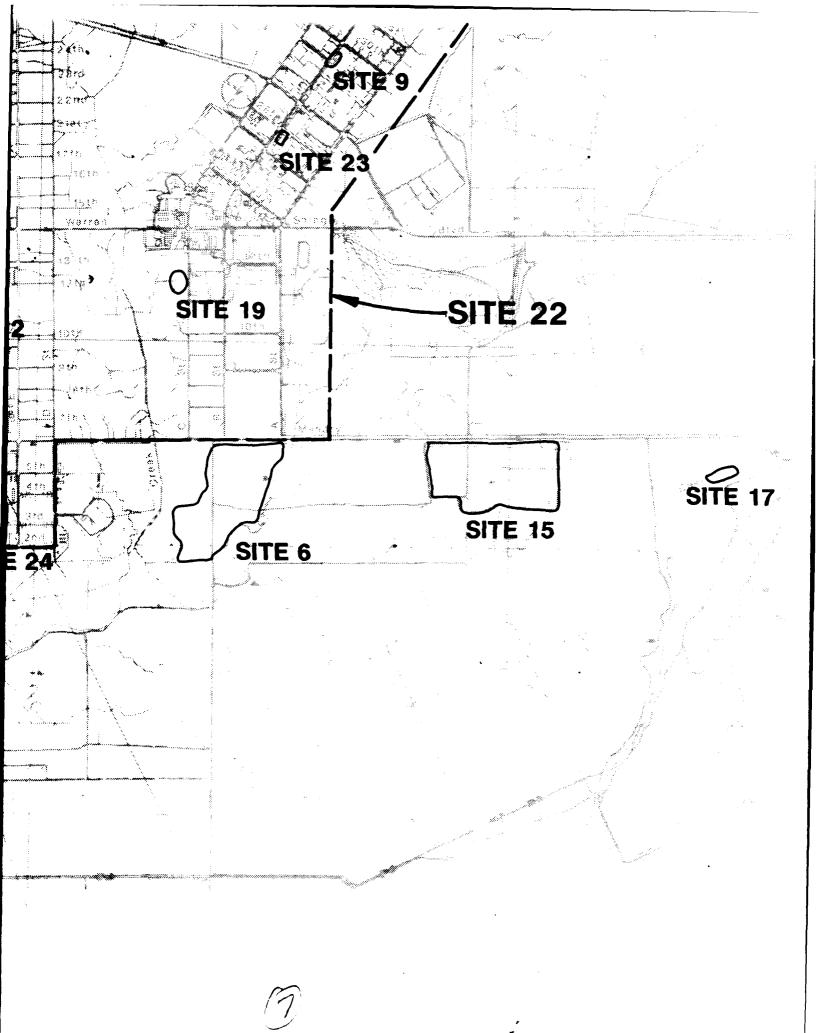












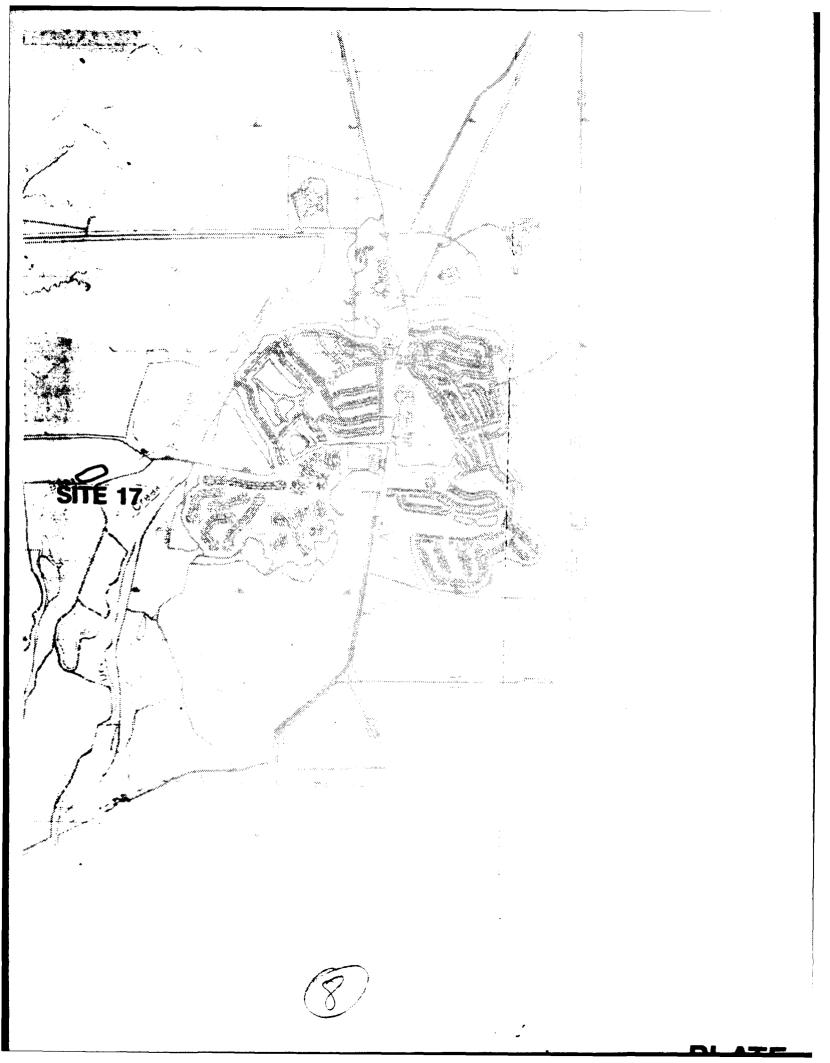
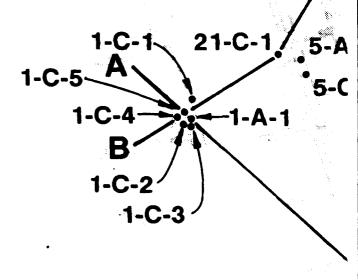


PLATE 1
IRP SITES AT BEALE AFB, CALIFORNIA

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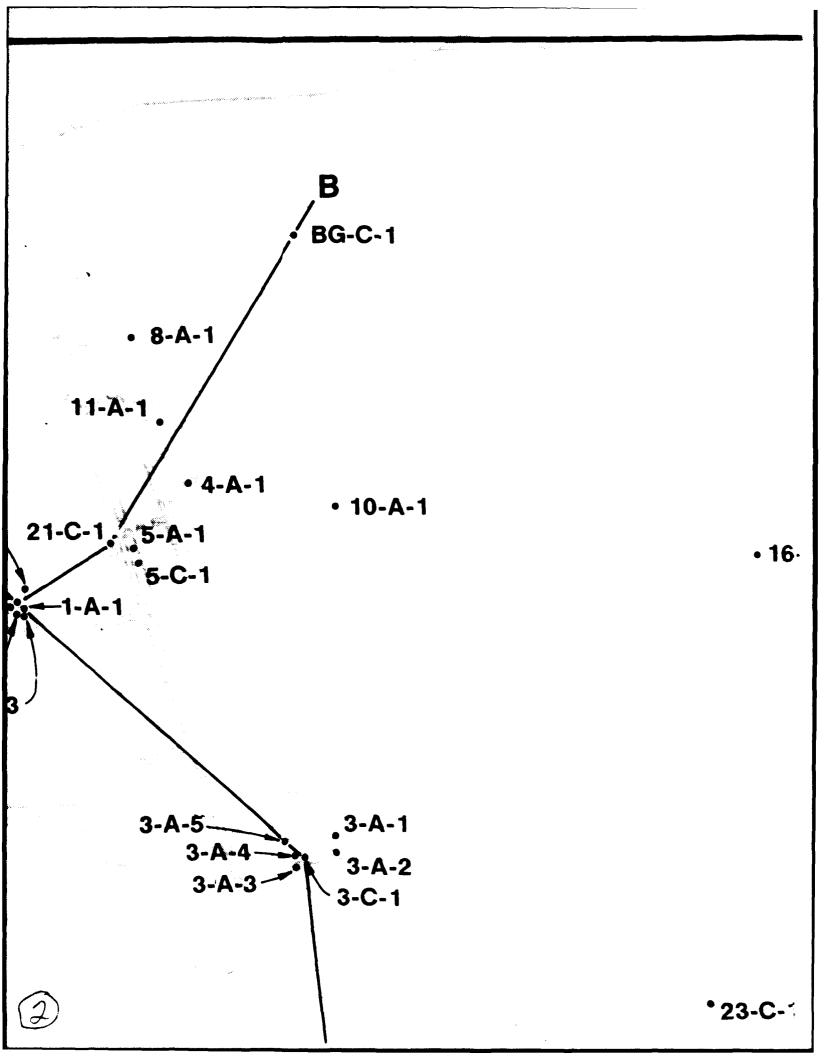


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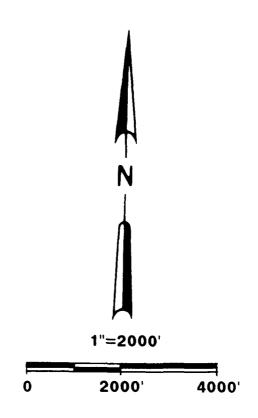


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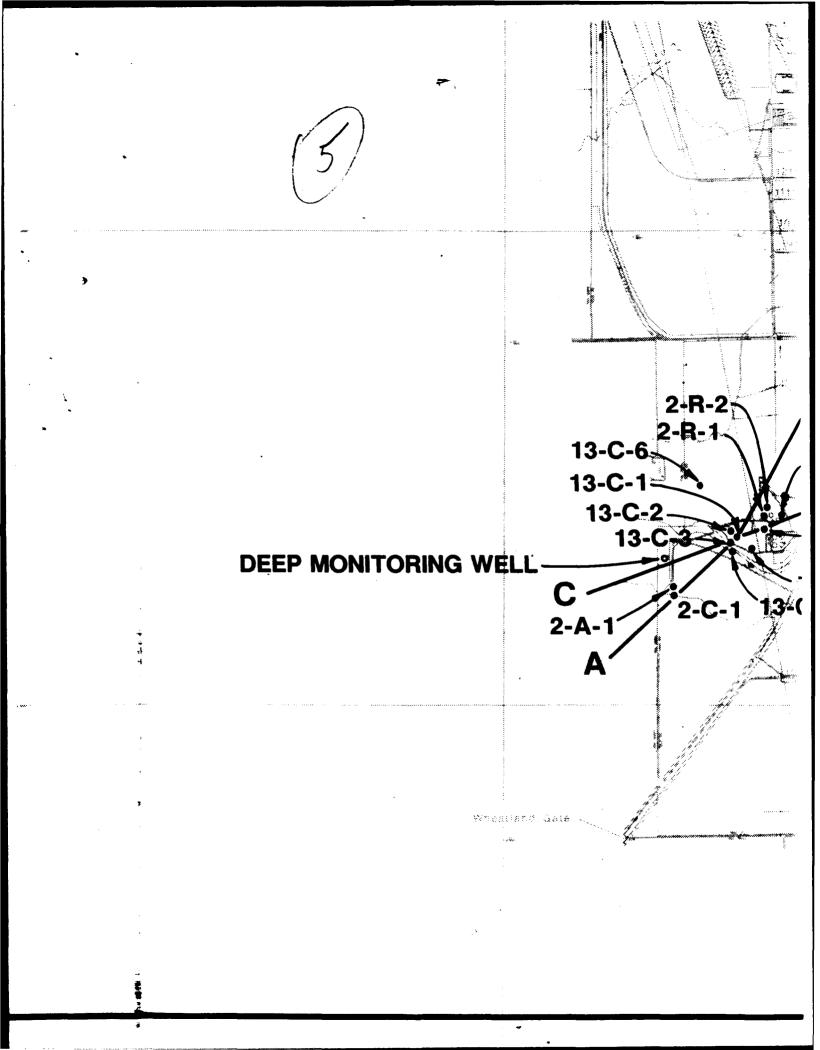


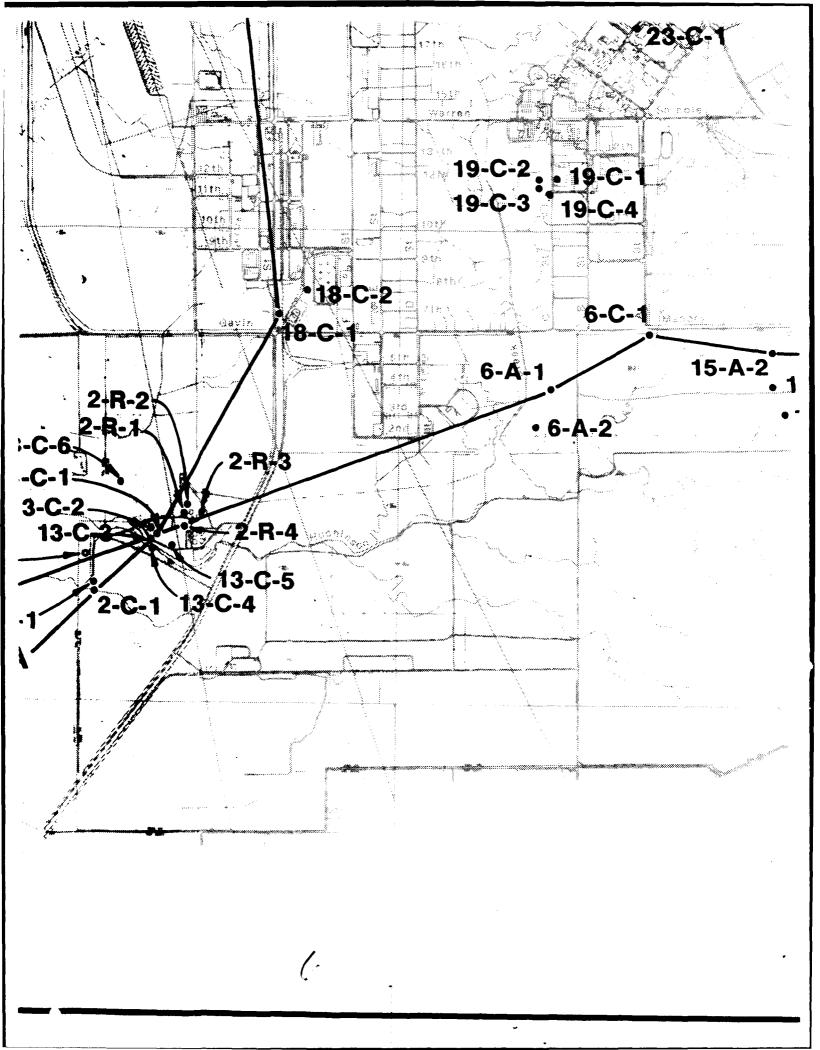


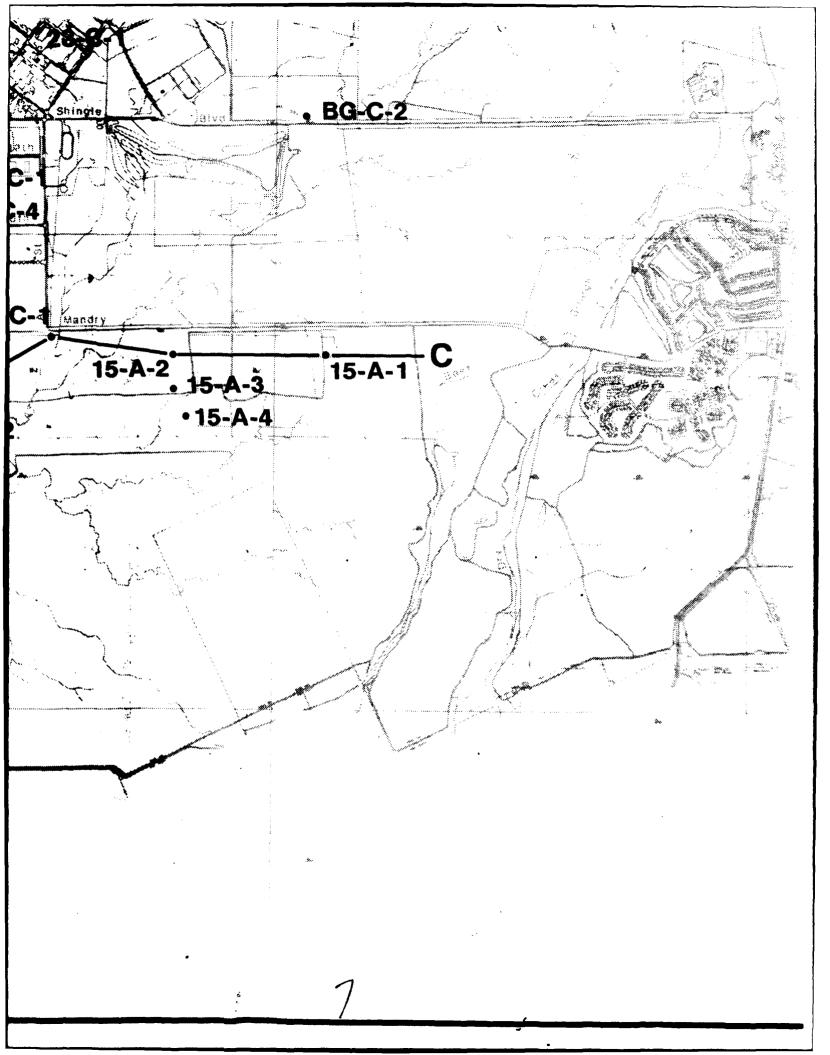
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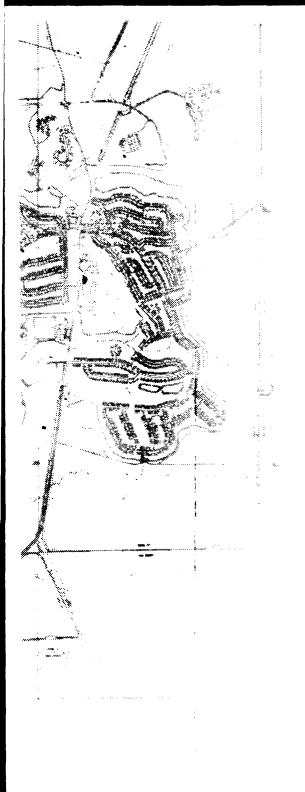
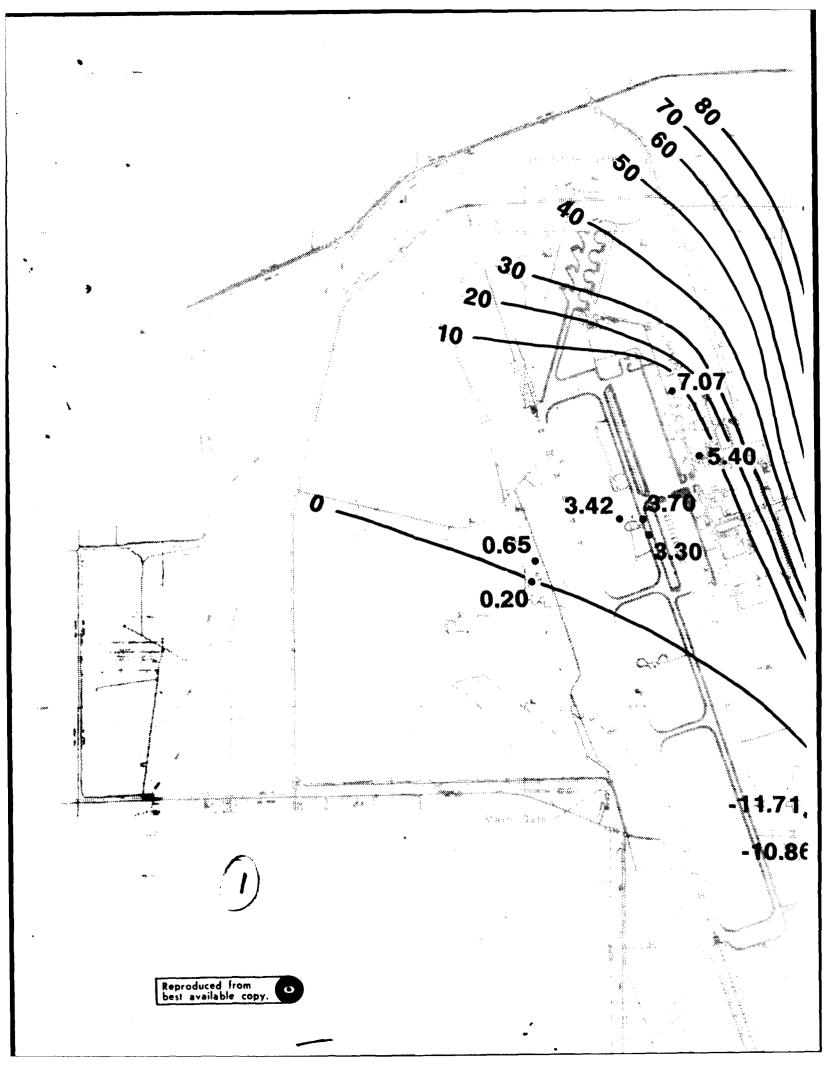
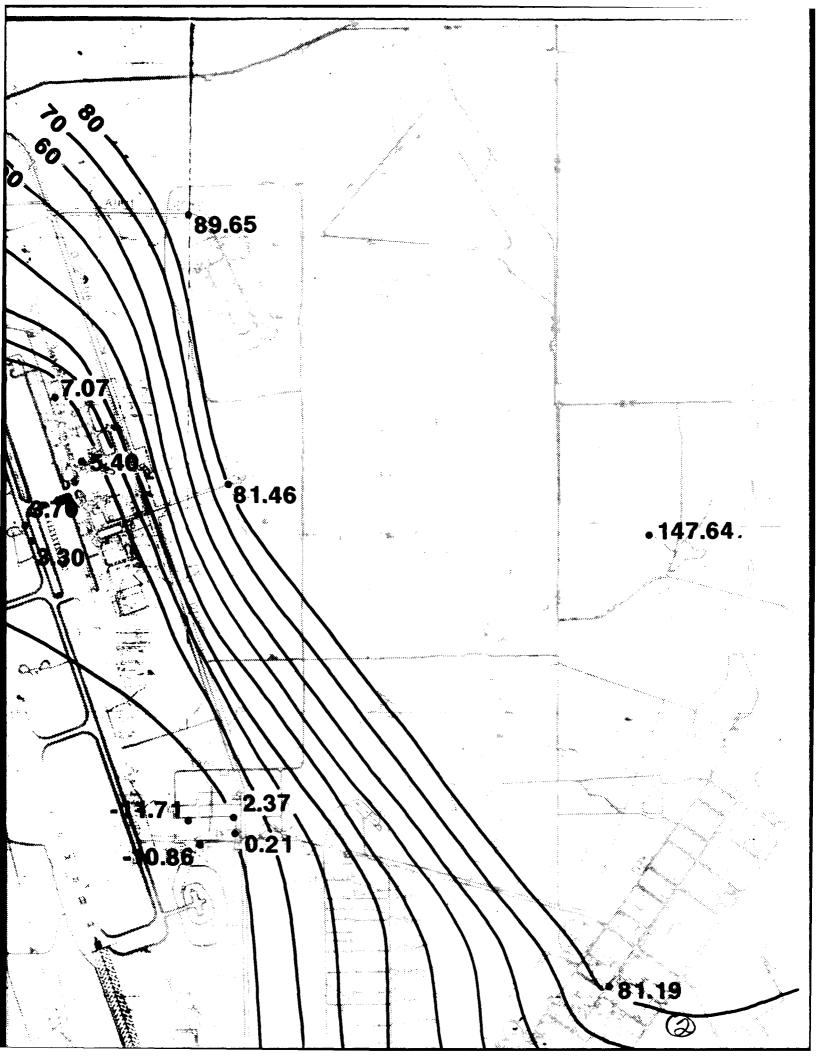
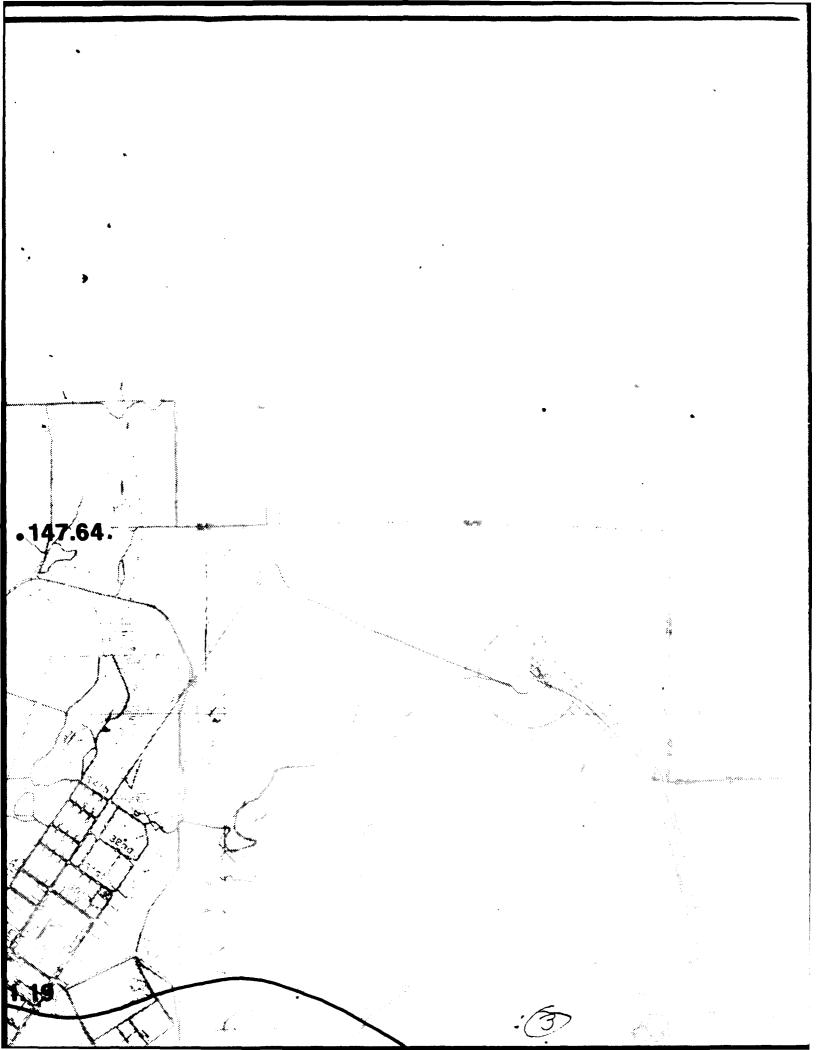


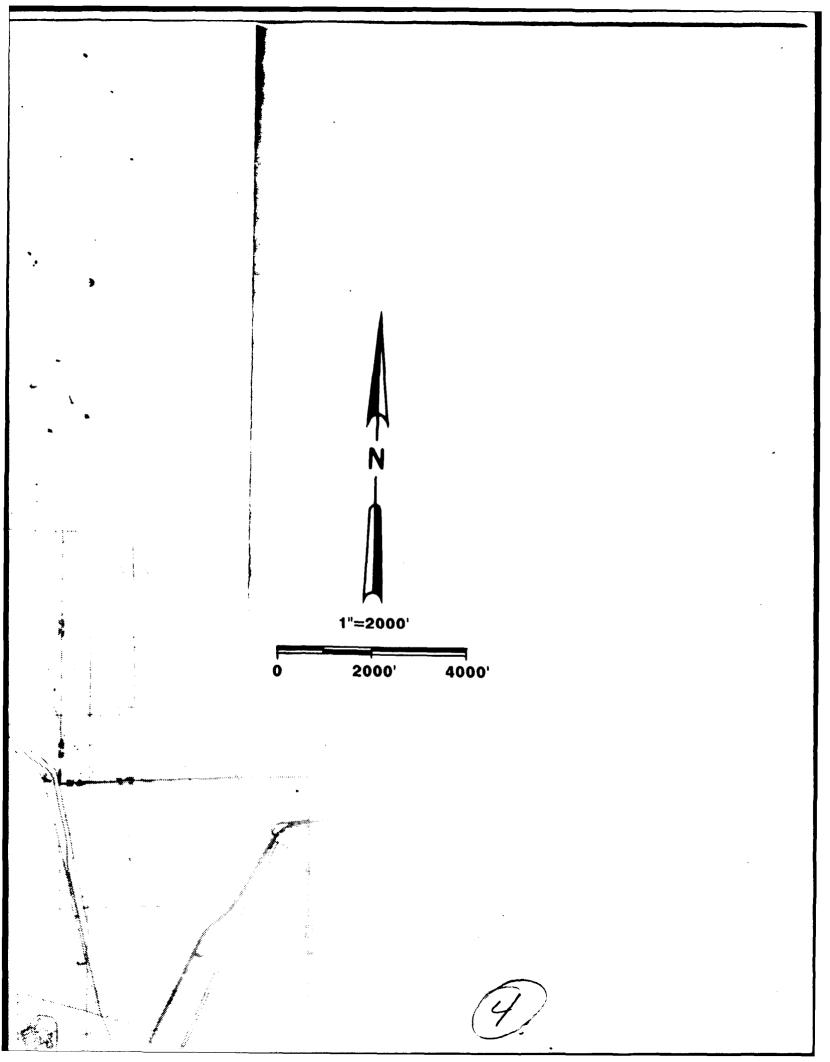
PLATE 2 WELL AND CROSS SECTION LOCATIONS BEALE AIR FORCE BASE

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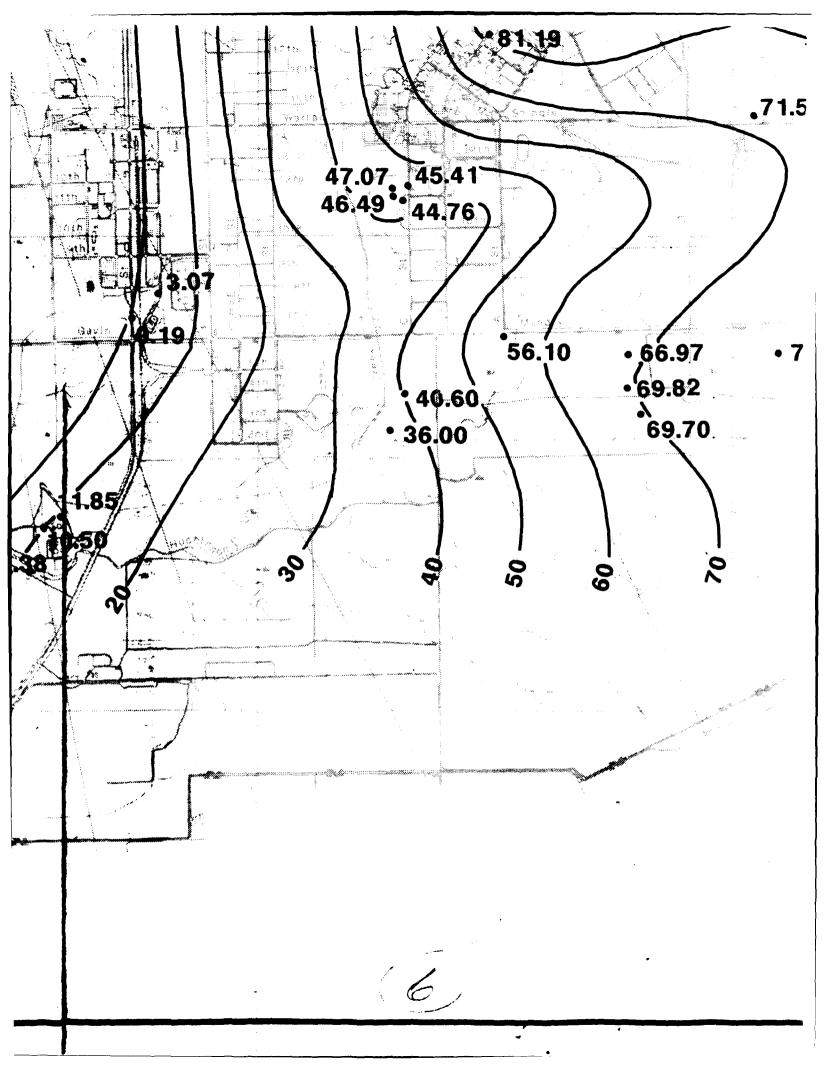






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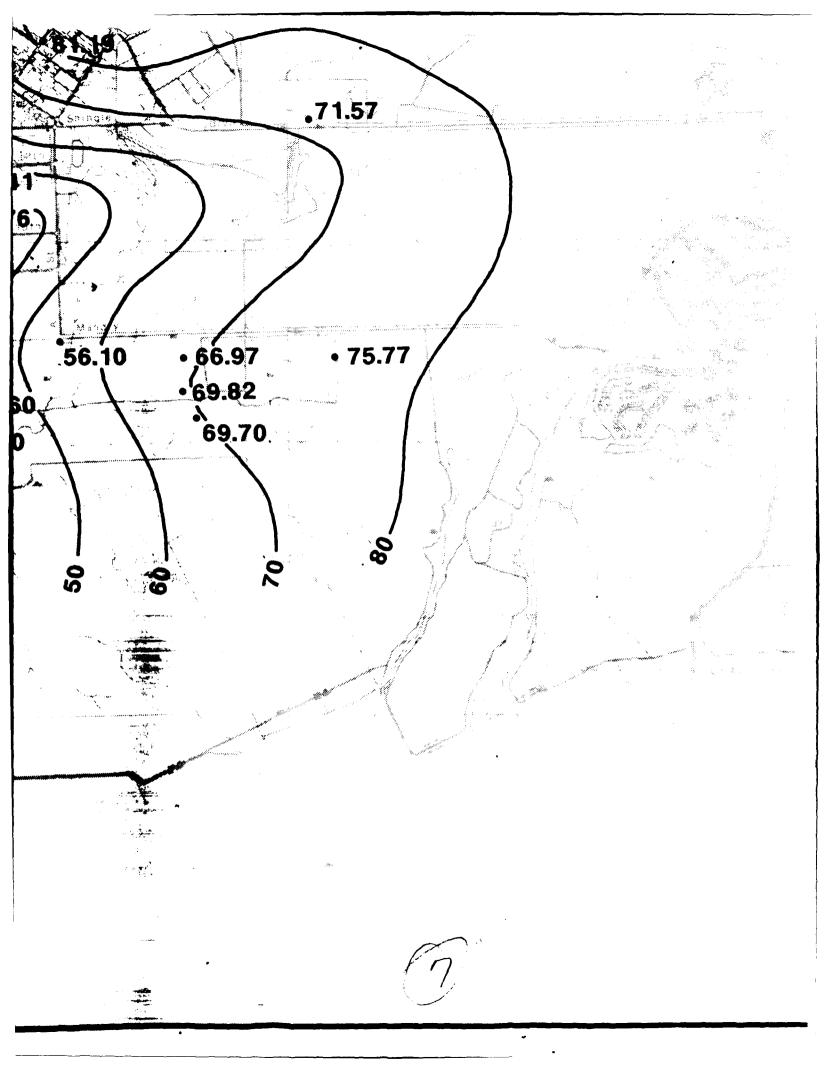


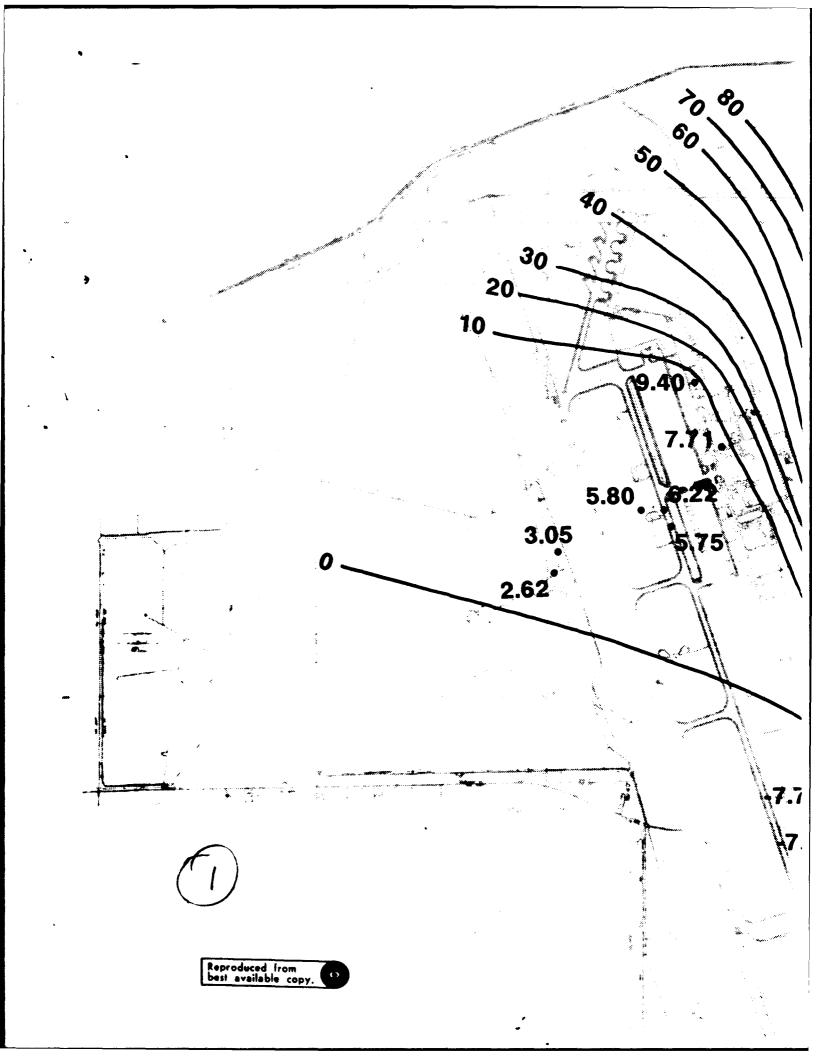


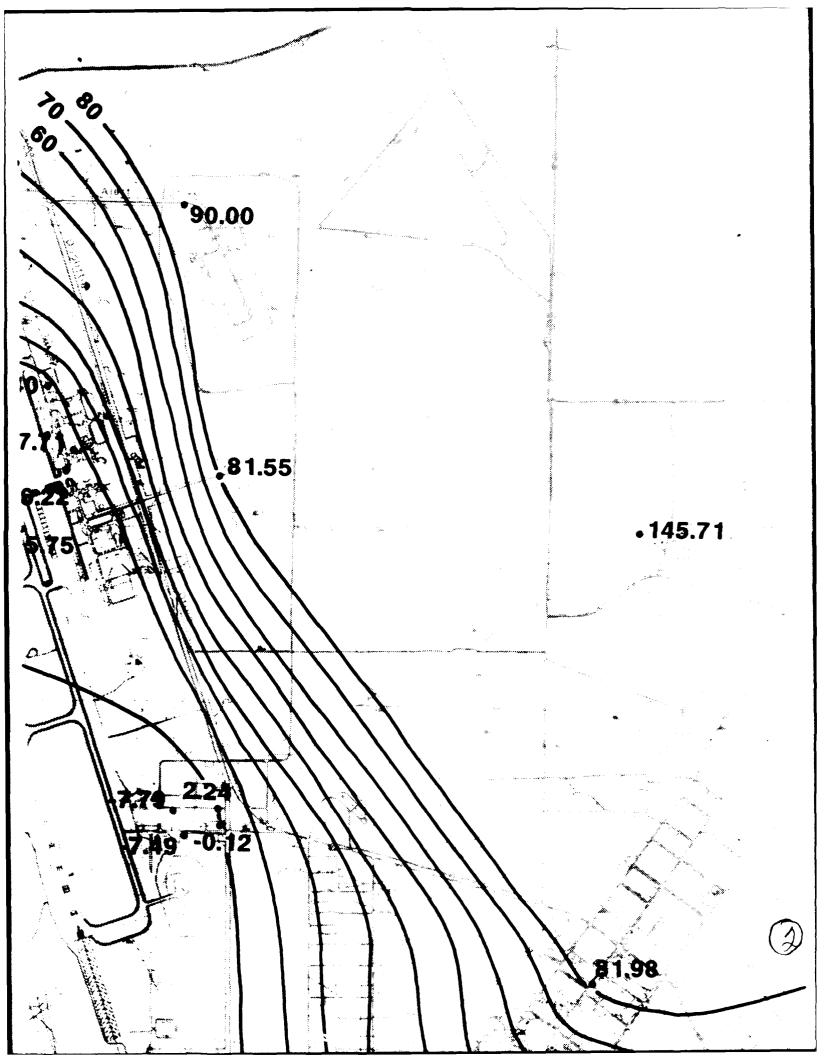


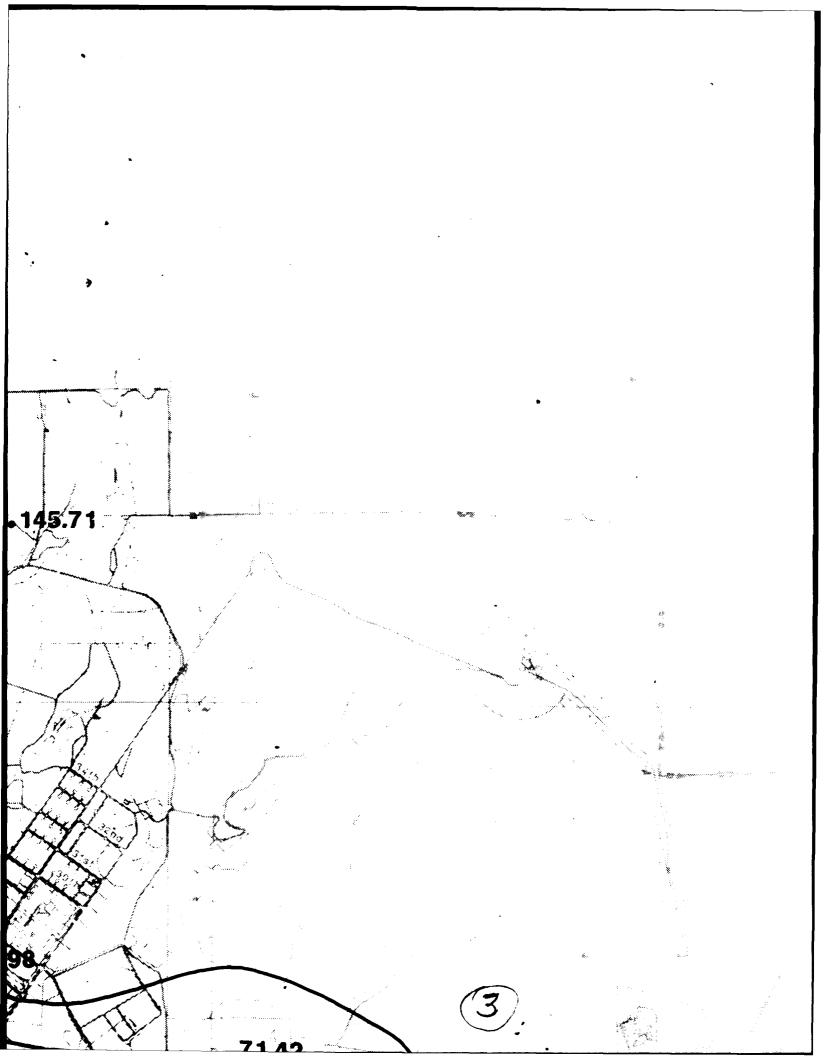
PLATE 3 GROUNDWATER ELEVATION CONTOUR MAP MARCH 27, 28, 1989 BEALE AIR FORCE BASE

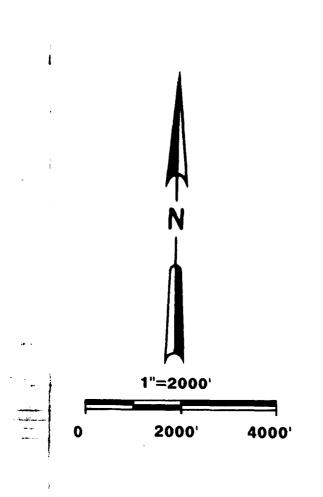


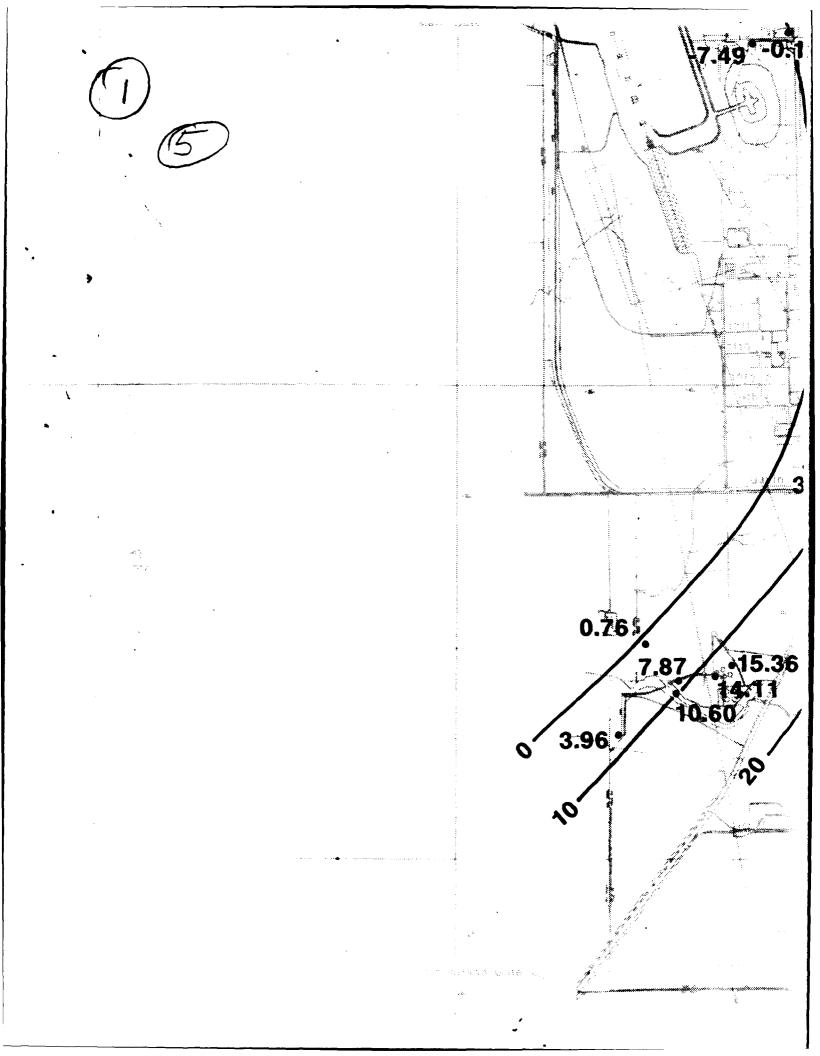
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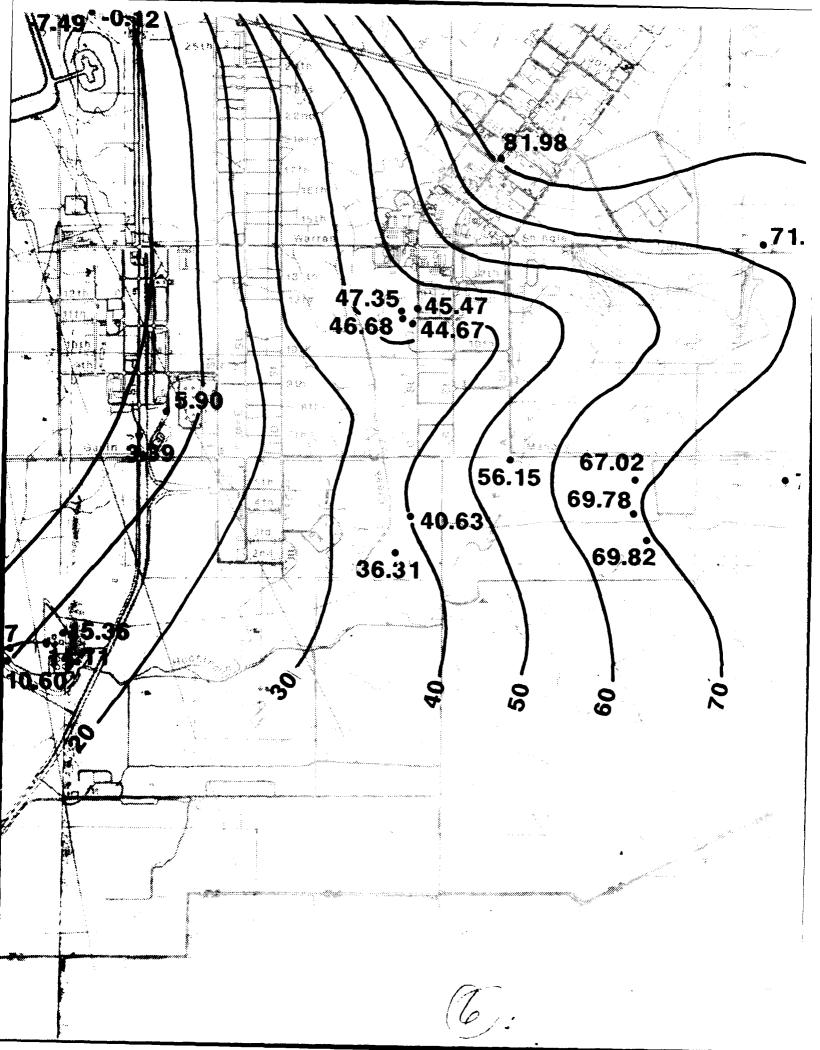


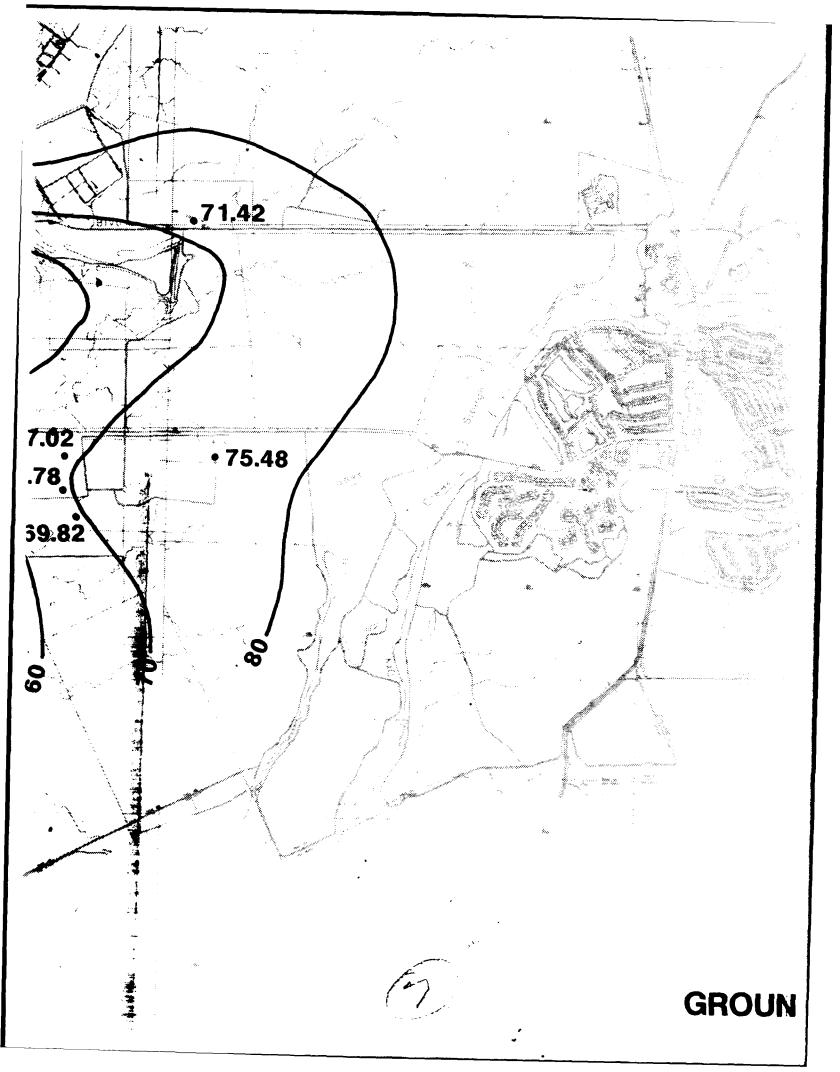












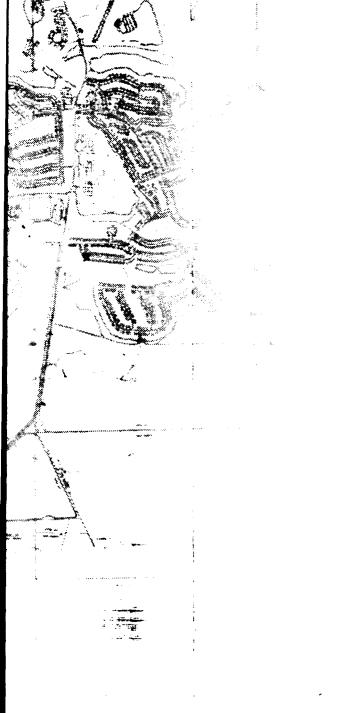


PLATE 4 GROUNDWATER ELEVATION CONTOUR MAP NOVEMBER 8, 9,10, 1989 BEALE AIR FORCE BASE

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